

**CROSS VALLEY CONTRACTORS
LONG-TERM CONTRACT RENEWAL
ENVIRONMENTAL ASSESSMENT**

DRAFT

**Bureau of Reclamation
Mid-Pacific Region
South Central California Area Office
2666 N. Grove Industrial Drive, #106
Fresno, California 93727-1551**

October 16, 2000

EXECUTIVE SUMMARY

INTRODUCTION

The U.S. Bureau of Reclamation (Reclamation) is preparing an environmental assessment (EA) to renew Cross Valley Contractor water service contracts, consistent with the provisions of Central Valley Project Improvement Act (CVPIA). The project alternatives will include the terms and conditions of the contracts.

Long-term contract renewal is necessary to:

- Continue beneficial use of water, developed and managed as part of the Central Valley Project (CVP), with a reasonable balance among competing demands, including the needs of irrigation and domestic uses; fish and wildlife protection, restoration, and mitigation; fish and wildlife enhancement; power generation; and other water uses consistent with requirements imposed by the State Water Resources Control Board and the CVPIA.
- Incorporate certain administrative conditions into the renewed contract to ensure CVP continued compliance with current federal reclamation law and other applicable statutes.
- Allow the continued reimbursement to the federal government for costs related to CVP construction and operation.

Long-term contract renewals (LTCRs) require environmental documentation prepared at the division or unit level. The EA analyzes the localized impacts of continued water delivery to eight Cross Valley Contractors resulting from a LTCR for a period of 25 years (Table ES-1).

Table ES-1
Cross Valley Contractors Contract Amounts

Cross Valley Contractors	Maximum Contract Amount (af/yr)
County of Fresno	3,000
Hills Valley Irrigation District	3,345
Kern-Tulare Water District	40,000
Lower Tule River Irrigation District	31,102
Pixley Irrigation District	31,102
Rag Gulch Water District	13,300
Tri-Valley Water District	1,142
County of Tulare	5,308

In 1975, the locally financed Cross Valley Canal began operations which routed water from the California Aqueduct to the eastside of the valley through a series of six lift pumps. The Cross Valley Canal begins at the California Aqueduct near Taft and conveys water across the valley to the Friant-Kern Canal near Bakersfield. Historically, water is delivered to the Arvin-Edison Water Storage District in exchange for a portion of their water supply available through Millerton Lake. Through a series of complex water purchases, transport and exchange agreements, water is exchanged between Arvin-Edison Water Storage District and Cross Valley water service contractors, with service agreements for CVP

water pumped from the Delta. These exchange contractors are located north of the Cross Valley Canal, along the Friant-Kern Canal. The water exchange and transfers are capable of bringing an additional 128,300 af annually to the eastside of the southern San Joaquin Valley.

Related Activities

There are related activities that are currently being implemented or planned by Reclamation and other agencies that could be affected by the findings of the EA. Additionally, Reclamation is implementing many activities related to the CVPIA and are similar to those presented in the PEIS.

Description of Alternatives

The No Action Alternative (NAA) assumes renewal of long-term CVP water service contracts for a period of 25 years in accordance with minimum implementation of CVPIA as described in the PEIS Preferred Alternative. The PEIS Preferred Action assumed that most contract provisions would be similar to the provisions in the 1997 CVP Interim Renewal Contracts, which included contract terms and conditions consistent with the requirements for CVPIA. In addition, the NAA assumed tiered pricing provisions and environmental commitments as described in the PEIS Preferred Alternative. The provisions of the NAA also are summarized in Table DA-1.

These provisions were described in the Final PEIS. These issues include tiered water pricing, definition of municipal and industrial water users, water measurement, and water conservation.

Alternative 1

Alternative 1 is based upon the proposal presented by CVP water service contractors to Reclamation in April 2000. However, there were several issues included in the April 2000 proposal that could not be included in Alternative 1 because they are not consistent with existing Federal or state requirements or would require a separate Federal action.

Alternative 2

Alternative 2 is based upon the proposal presented by Reclamation to CVP water service contractors in November 1999. However, there were several provisions included in the November 1999 proposal that could not be included in Alternative 2 because they would require a separate Federal action.

The November 1999 proposal did include several provisions that were different than the assumptions for NAA and included in Alternative 2. The primary differences are related to tiered pricing and the definition of municipal and industrial users.

SUMMARY OF IMPACTS

The potential impacts associated with the alternatives are summarized below and are described in detail in Section 3 of the EA (Table ES-2).

Table ES-2
Summary of Potential Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
Surface Water	Contractors will continue to use available surface water and pump ground water. The surface water available to the contractors is reduced from the historic levels because of pumping constraints at the Delta and the impacts of this reduction are described in the PEIS.	Similar effects as the NAA.	<p>In most years this alternative would result in little or no change in water use from the NAA. In other years, Cross Valley Contractors would tend to switch from ground water to surface water. This change will not have an effect on the San Joaquin River flows or other streams in the region. Changes in surface water use will not result in additional diversions from the Delta or changes to San Luis reservoir storage.</p> <p>Alternative 2 will not affect the deliveries in the Friant-Kern Canal or storage in Millerton Lake.</p>
Water Supply	Historic mixed uses of both ground water and CVP surface water in the Cross Valley Canal area are expected to continue. More emphasis on ground water use is expected during periods when CVP surface water is limited or expensive. Overall, the diversions from the Delta to meet south of Delta demands are less under the NAA than historically observed.	Similar effects as the NAA.	<p>Minimal changes are anticipated for irrigated acres in most year types for most of the subbasins.</p> <p>Contractors may switch from ground water to surface water in certain years because of tiered water pricing. The additional CVP water purchased by the</p>

Table ES-2
Summary of Potential Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
			Contractors would come from San Luis Reservoir and the Delta. The total diversions from the Delta are not anticipated to change with the tiered pricing.
			Contractors receive water from Millerton Lake through an exchange with Arvin Edison Water Storage District. Changes in CVP water because of this alternative would not affect this exchange.
Ground Water	During dry water conditions ground water usage increases in response to decreases in surface water supplies. Contractors return to greater surface water usage after the dry conditions end.	Similar effects as the NAA.	A single year of decreased ground water pumping will not adversely or beneficially affect the ground water basin. Over the long term, the ground water use in subbasin 17 would decrease. This would have a beneficial impact on the ground water basin.
Water Quality	Water quality in the rivers and ground water of the Cross Valley Contractor service area under the NAA is not anticipated to change from past conditions. Factors that tend to influence water quality, such as agricultural runoff, will continue similar to historic conditions. However, the average delivery south-of-the-Delta is projected to decline from historic conditions. This	Similar effects as the NAA.	A decrease in ground water pumping in subbasins 17, 18 and 20 is anticipated. This decrease in pumping should have a small, but unquantifiable, benefit to water quality as farmers switch to better-quality surface water.

Table ES-2
Summary of Potential Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
	may increase ground water demands and may result in application of water of a lesser quality than surface water. Continued application of this water under the NAA may influence water quality over the long term.		
Fisheries	Water use is expected to continue as it has using both CVP surface water supplies and ground water. Ground water has typically been more important during dry years when CVP water is less available. Therefore no effects on fisheries are predicted.	Similar effects as the NAA.	Water would remain in Millerton Lake until purchased by Cross Valley users. Water not purchased would likely be picked up by other users. It could result in different timing in the movement of water in the Cross Valley Canal.
Land Use	The estimated irrigated acreage in the three subregions in an average water year total 1,055,500 acres. In a wet year the total average irrigated acres would increase by 2,800 acres (0.3%). In a dry year the irrigated acres would decrease by about 23,600 acres (2.2%).	Similar effects as the NAA.	Compared to the NAA, in average and dry years there is no change in irrigated acreage. In wet years there is a decrease in irrigated acres by 1,200 (0.1%).
Biological	Cross Valley management and operations will continue as under current conditions. No impacts to vegetation and wildlife are expected, since no additional infrastructure (i.e., dams, increase in dam heights, canals, etc.) will be constructed. Additionally, under this alternative, there will be no increase in deliveries and no conversion of existing natural habitat into farmland.	Similar effects as the NAA.	The additional water cost could result in an increase in the amount of land left fallow. If fallowed lands are restored to native conditions, they could provide habitat for regional vegetation and wildlife.

Table ES-2
Summary of Potential Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
			<p>A decrease in some agricultural crops (e.g., alfalfa and grain crops), could potentially impact the amount of nesting and feeding habitat for wildlife in the area. While a reduction in the amount of alfalfa or grain acreage could impact some species, restoration of these lands to a more natural condition would likely provide benefits to listed and other species considered sensitive.</p> <p>As the cost of water increases, the opportunity to provide wetland habitat by private landowners generally decreases. This could result in a decrease in availability of wetland habitat in the Cross Valley region. However, if water use decreases, more water may be available to flow down the San Joaquin, Chowchilla, and Fresno Rivers. Increased flows along these waterways would enhance the riparian zones, resulting in enhanced habitat quality for wildlife.</p>

Table ES-2
Summary of Potential Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
Recreational	Existing Cross Valley facilities continue to operate as under current conditions; recreational facilities and resources do not change.	Similar effects as the NAA.	Similar to the NAA.
Socioeconomic	Gross revenues for the Cross Valley subregions are about \$2.1 million and produce about 22% of valley-wide net income.	Similar effects as the NAA.	A reduction of \$1 million is estimated for gross revenue or less than 1% in all scenarios ending in a wet year. The maximum net revenue, changes less than 1% in all economic scenarios. Total employment output and place-of-work income impact is less than 1%.
Cultural	The NAA would not result in direct impact to eligible or significant cultural resources. Water apportioned under the NAA may be used to alter the use of a landscape, either through inundation, irrigation-related construction, or some other change which could impact cultural resources. The entities responsible at this level for potential impacts to cultural resources are the contracting agencies – the individual water districts.	Similar effects as the NAA.	Similar to the NAA.
Social Conditions	The existing Cross Valley operations do not change and social condition are unchanged.	Similar effects as the NAA.	Similar to the NAA.
Air Quality	The existing operations of Cross Valley facilities and COE reservoirs do not change and the air quality is unchanged.	Similar effects as the NAA.	Similar to the NAA.

Table ES-2
Summary of Potential Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
Geology and Soils	The operation of Cross Valley facilities and reservoirs are unchanged and soil and geology conditions do not change.	Similar effects as the NAA.	Over the long term the ground water use in subbasin 17 would decrease. Retired or fallowed agricultural production lands will have a cover crop planted in the last year of cultivation.
Visual	The existing operations of Cross Valley facilities and reservoirs do not change and visual resources are not changed.	Similar effects as the NAA.	Similar to the NAA.

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ACRONYMS AND ABBREVIATIONS

AAQS	ambient air quality standard
af	acre-feet
af/yr	acre-feet per year
AFRP	Anadromous Fish Restoration Program
APE	area of potential effect
CALFED	CALFED Bay-Delta Program
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
COE	Army Corp of Engineers
CRHR	California Register of Historic Resources
CVGSM	Central Valley Groundwater-Surface Water Simulation Model
CVP	Central Valley Project
CVPM	Central Valley Production Model
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento-San Joaquin River Delta
EA	Environmental assessment
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FWUA	Friant Water Users Authority
HABS/HAER	Historic American Building Survey/Historic American Engineering Register
LTCR	long-term contract renewal
M&I	municipal and industrial
NAA	No action alternative
NAHC	California Native American Heritage Commission
NEPA	National Environmental Policy Act
NHPA	Natural Historic Preservation Act
NRDC	National Resource Defense Council
PEIS	Programmatic Environmental Impact Statement
PM _{10,2.5}	particulate matter less than or equal to 10 or 2.5 microns
Reclamation	U.S. Bureau of Reclamation
Regional Board	Central Valley Regional Water Quality Control Board
SANJASM	San Joaquin Area Simulation Model
SJRRHRP	San Joaquin River Riparian Habitat Restoration Program
Service	U.S. Fish and Wildlife Service
State Board	State Water Resources Control Board
SWP	State Water Project
USFS	U.S. Forest Service
VMS	visual management system
Fg/m ³	micrograms per cubic meter

GLOSSARY OF TERMS

Category 1 Water	Quantity of project water that is reasonably likely to be available during a year for delivery to the contractor, and will be calculated on an annual basis as the average quantity of delivered water provided to the contractor during the most recent 5-year period for which the contracting officer has completed or finalized total water deliveries for project rate-setting purposes.
Category 2 Water	Additional quantity of project water in excess of category 1 water that may be delivered to the contractor in some years.
Contract Rate	The water service rate required in the contractor's current contract. Depending on the contract, this rate may be fixed, adjustable, cost-of-service, or other.
Contract Total	That quantity of CVP water identified on an annual basis as Category 1 Water and used in calculating the Tiered Pricing Component.
Cost-of-Service Rate	The annual rate established pursuant to the then applicable water rate-setting policies that will recover all costs assigned to the irrigation and municipal and industrial water supply functions, respectively, within the established repayment period.
Fixed Rate	Flat rate established in the original long-term water service contract. The fixed rate for irrigation typically ranges between \$2.00 – 8.00 per acre-foot. Municipal and industrial fixed rates typically range from \$9.00 – 18.50 per acre-foot.
Full Cost Rate	Irrigation and M&I cost-of-service rates that repay capital with interest using interest rates and methodology set under Reclamation Reform Act Section 202(3).
Repayment Period	The time frame for recovery of the capital investment of a project. The repayment period for CVP In-Basin facilities is fiscal year 1981 through fiscal year 2030. The repayment period for CVP Out-of-Basin facilities extends from fiscal year 1987 through fiscal year 2036.
Tier Water Pricing	The payments per acre-foot of CVP water calculated pursuant to Article 7(b) of the renewal contract that are required to be remitted to the U.S. in support of tiered water pricing charges pursuant to the CVPIA.

Table PN-2
Related Activities

Project or Study and Lead Agency	Summary
	<p>Under the terms of the pilot project agreement, FWUA users supplied 35,000 af of CVP water. However, an exchange arrangement would replace the water donated by the FWUA users. Reclamation would replace the 35,000 af by redirecting water from the Delta that otherwise would have been scheduled for use at Mendota Pool. The redirected water would be conveyed down the California Aqueduct to the Cross Valley Canal in Kern County to complete the return of water to the Friant users.</p> <p>Additionally, Reclamation purchased and supplied 15,000 af of CVP water to make up for potentially significant river channel conveyance losses incurred between Friant Dam and Mendota Pool. This replacement water was also conveyed through the California Aqueduct to the Cross Valley Canal for delivery to the Friant users. The 1999 Pilot Program began on July 3, 1999, and concluded on February 29, 2000. Water for this activity came from willing sellers. No new water was allocated from the CVP.</p>

SECTION 2

DESCRIPTION OF ALTERNATIVES

INTRODUCTION

This section summarizes the long-term water service contract negotiations process and descriptions of the alternatives considered in this EA.

Long-Term Water Service Contract Negotiations Process

The CVPIA states that the Secretary shall, upon request, renew any existing long-term irrigation repayment or water service contract for the delivery of CVP water for a period of 25 years and may renew such contracts for successive periods of up to 25 years each. Consistent with the 1963 Act, M&I contracts shall be renewed for successive periods up to 40 years each under terms and conditions that are mutually agreeable. The CVPIA also states that no renewals shall be authorized until appropriate environmental review, including the PEIS, has been completed. The PEIS provided a programmatic environmental analysis and identified the need for site-specific environmental documents for the long-term contract renewal process.

The CVPIA also stated that contracts which expire prior to the completion of the PEIS may be renewed for interim periods. The interim renewal contracts reflect existing Reclamation law, including modifications due to the Reclamation Reform Act and applicable CVPIA requirements. The initial interim contract renewals were negotiated in 1994 with subsequent renewals for periods of 2 years or less to provide for continued water service. Many of the provisions from the interim contracts were assumed to be part of the contract renewal provisions in the description of the PEIS Preferred Alternative.

In 1998, the long-term contract renewal process was initiated. Reclamation reviewed the interim contract provisions that were consistent with Reclamation law and other requirements, comments from the Draft PEIS, and comments obtained during the interim contract renewal process. Reclamation proposed that the overall provisions of the long-term contract would be negotiated with representatives of all CVP water service contractors. Following the acceptance of the CVP-wide provisions, Reclamation proposed that division-specific provisions and, finally, contractor-specific provisions would be negotiated. Reclamation also proposed that all water service contracts except for Central San Joaquin Irrigation District, Stockton East Water District, and Colusa Drain Mutual Water Company would be renewed pursuant to this action. Contract renewals for these three districts would be delayed until the completion of a water management studies for their primary sources of CVP water, the Stanislaus River and the Sacramento River.

Reclamation published the initial proposed contract in November 1999. There were several negotiations sessions throughout the next six months. The CVP water service contractors published a counter-proposal in April 2000. The November 1999 proposal represents one "bookend" for negotiations and the April 2000 proposal represents the other "bookend." The results of the negotiations are reflected in the subsequent proposals. The primary differences between the proposals are summarized in Table D-1.

Issues Considered as Part of Long-Term Contract Renewals

The long-term contract renewal process addressed several other issues in addition to the contract provisions. These issues include the needs analyses, changes in service areas, and water transfers.

Needs Analyses

The water rights granted to the CVP by the SWRCB require the Federal government to determine that the water is being used in a beneficial manner. The needs analysis methodology was developed to indicate that the CVP water is being used beneficially. The needs analysis was computed for each District within the various divisions or units of the CVP using a multiple-step approach. First, the existing water demand was calculated for each district. For agricultural contractors, crop acreage, cropping patterns, crop water needs, effective precipitation, and conveyance losses were reviewed. For municipal and industrial contractors, residential, commercial, industrial, institutional, recreational, and environmental uses; landscape coefficients; system losses; and landscape acreage were reviewed. Second, future changes in water demands based upon crops, municipal and industrial expansion, and changes in efficiencies were reviewed. Third, existing and future non-CVP water supplies were identified for each district, including groundwater and other surface water supplies. The initial calculation of CVP water needs was limited by the assumption that groundwater pumping would not exceed the safe yield of the aquifer. In addition, the actual water needs were calculated at each division or unit level to allow for intra-regional transfers on an annual basis.

Beneficial and efficient future water demands were identified for each district. The demands were compared to available non-CVP water supplies to determine the need for CVP water. If the need was less than contract amounts, the CVP water service contract amount could be reduced. Because the CVP was initially established as a supplemental water supply for areas without adequate supplies, the needs for most districts are at least equal to the CVP water service contract and frequently exceeded the previous contract amount. However, this environmental analysis does not include increased total contract amounts. Therefore, the CVP contract amount will be limited by the existing CVP contract quantity.

Changes in Water Service Areas

This environmental analysis does not consider changes in future water service area boundaries for use of CVP water. Any future changes to water service area boundaries for use of CVP water will be evaluated in separate technical and environmental analyses.

Water Transfers

Several different types of transfers are considered for long-term contract renewals. Intra-CVP contract transfers have occurred regularly throughout the CVP and are frequently limited to scheduling changes between adjoining districts. Reclamation has historically issued and will continue to address these types of transfers under separate environmental analysis.

It is recognized that water transfers will continue to occur and that the CVP long-term contracts will provide the mechanism. Because CVPIA has allowed these transfers, as evaluated in the PEIS for the Preferred Alternative, the No Action Alternative (NAA) includes water transfer provisions. These provisions for transfers are also included in both Alternatives 1 and 2. However, it is difficult to identify

all of the water transfer programs that could occur with CVP water in the next 25 years. Reclamation would continue with separate environmental documents for proposed transfers in establishing criteria and protocols to allow rapid technical and environmental review of future proposed transfers.

DEVELOPMENT OF ALTERNATIVES

Three alternatives were identified for the renewal of long-term contracts between Reclamation and the Cross Valley Contractors.

The alternatives present a range of water service agreement provisions that could be implemented for long-term contract renewals. The No Action Alternative (NAA) consists of renewing existing water service contracts as described by the Preferred Alternative of the PEIS. In November 1999, Reclamation published a proposed long-term water service contract. In April 2000, the CVP Contractors presented an alternative long-term water service contract. Reclamation and the CVP Contractors continued to negotiate the CVP-wide terms and conditions with these proposals serving as “bookends.” This EA also considers these proposals with the NAA as bookends in the the environmental documentation to evaluate the impacts and benefits of the renewing long-term water service contracts.

No Action Alternative

The NAA assumes renewal of long-term CVP water service contracts for a period of 25 years in accordance with implementation of CVPIA as described in the PEIS Preferred Alternative. The PEIS Preferred Action assumed that most contract provisions would be similar to many of the provisions in the 1997 CVP Interim Renewal Contracts, which included contract terms and conditions consistent with applicable CVPIA requirements. In addition, the NAA assumes tiered pricing provisions and environmental commitments as described in the PEIS Preferred Alternative. The provisions of the NAA are summarized in Table DA-1. These provisions were described in the Final PEIS.

Several applicable CVPIA provisions are summarized in the description of the NAA as they are addressed in a different manner in Alternatives 1 and/or 2, and therefore could result in changes in environmental impacts or benefits. These issues include tiered water pricing, definition of municipal and industrial water users, water measurement, and water conservation.

Tiered Water Pricing. Tiered water pricing in the No Action Alternative is based upon use of a "80/10/10 Tiered Water Pricing from Contract Rate to Full Cost" including appropriate Ability-to-Pay limitations. Under this approach, the first 80% of the maximum contract total would be priced at the applicable Contract Rate. The next 10% of the contract total would be priced at a rate equal to the average of the Contract Rate and Full Cost Rate. The final 10% of the contract total would be priced at Full Cost Rate. The terms "Contract Rate" and "Full Cost Rate" are defined by the CVP ratesetting policies, and P.L. 99-546 and the Reclamation Reform Act (RRA), respectively. The Contract Rate for irrigation and M&I water includes the contractor's allocated share of CVP main project O&M, O&M deficit (if any) and capital cost. The contract rate for irrigation water does not include interest on capital. The contract rate

for M&I water includes interest on capital computed at the CVP M&I interest rate. The Full Cost rate for irrigation and M&I water includes interest at the RRA interest rate.

In addition to the CVP water rate, contractors are required to pay a Restoration payment on all deliveries on CVP water. Reclamation law and policy provides full or partial relief to irrigation contractors on Restoration Payments and the capital rate component of the water rate. Ability-to-pay relief, relative to the irrigation water rate, is fully applicable only to the first 80% of the contract total. Ability-to-pay relief is not applicable to the third tier water rate. The second tier may reflect partial Ability-to-pay relief, as it is equal to the average of the first and third tiers. The relief could be up to 100% of the capital cost repayment and is based upon local farm budgets. The Ability-to-Pay law and policy do not apply to CVP operation and maintenance costs, municipal or industrial water rates, CVP distribution facilities, or non-CVP water costs.

Definition of Municipal and Industrial Users. The definition of municipal and industrial users was established in portions of a 1982 Reclamation policy memorandum. In many instances, the definition of municipal users is easily definable. However, with respect to small tracts of land, the 1982 memorandum identified agricultural water as agricultural water service to tracts that can support \$5,000 gross income for a commercial farm operation. The memorandum indicates that this criteria can be generally met by parcels greater than 2 acres. Based on this analysis, the CVP has generally applied a definition of 5 acres or less for municipal and industrial uses in the CVP for many years. The CVP contractors can seek a modification for a demonstrated need of agricultural use on parcels between 2 and 5 acres in size and request such a modification from the Contracting Officer.

Water Measurement. The NAA includes water measurement at every turnout or connection to measure CVP water deliveries. It is assumed that if other sources are commingled with the CVP water, including groundwater or other surface waters, that the measurement devices would report gross water deliveries. Additional calculations would be required to determine the exact quantity of CVP water. However, if groundwater or other surface waters are delivered by other means to the users, the NAA did not include additional measurement devices except as required by individual users' water conservation plans.

Water Conservation. The water conservation assumptions in the NAA include water conservation actions for municipal and on-farm uses assumed in the DWR Bulletin 160-93; and conservation plans completed under the 1982 Reclamation Reform Act consistent with criteria and requirements of the CVPIA. Such criteria address cost-effective Best Management Practices that are economical and appropriate, including measurement devices, pricing structures, demand management, public information; and financial incentives.

Alternative 1

Alternative 1 is based upon the proposal presented by CVP water service contractors to Reclamation in April 2000. However, there were several issues included in the April 2000 proposal that could not be included in Alternative 1 because they are not consistent with existing Federal or state requirements or would require a separate Federal action, as described below.

- C The April 2000 proposal includes Terms and Conditions to provide a highly reliable water supply, and provisions to improve the water supply capabilities of the CVP facilities and operations to meet this goal - *These issues were not included in Alternative 1 because the issues would require additional Federal actions with separate environmental documentation*

and also limit the Secretary's obligation to achieve a reasonable balance among competing demands as required by the CVPIA. Currently Reclamation is completing the least cost plan to restore project yield in accordance with Section 3408(j) of CVPIA and under the CALFED program.

- C The April 2000 proposal includes language to require renewal of contracts after 25 years upon request of the contractor - *The study period for this EA is 25 years which coincides with the contract period applicable to irrigation contracts and required by CVPIA. Renewal after 25 years would be a new Federal Action and would require new environmental documentation.*
- C The April 2000 proposal did not include provisions for compliance with biological opinions - *Biological consultations are required by the Consultation and Coordination requirements established by Executive Order for all Reclamation activities. These are binding on Reclamation and provisions are needed to address this requirement.*
- C The April 2000 proposal included provisions for water transfers - *It is recognized that water transfers will continue and that the CVP long-term contracts will provide the mechanisms for the transfers. However, it would be difficult to identify all of the water transfer programs that could occur with CVP water in the next 25 years. Reclamation would continue with separate environmental documents for transfers, and will establish criteria for rapid technical and environmental review of proposed transfers.*
- C The April 2000 proposal includes provisions for transfer of operations and maintenance requirements - *It is recognized that transfers of operation and maintenance to the group of contractors will continue and that the CVP long-term contracts will provide the mechanisms for such transfers. However, it would be difficult to identify all of the operation and maintenance transfer programs that could occur with CVP water in the next 25 years. Reclamation would require separate environmental documents for such transfers.*
- C The April 2000 proposal includes provisions for resolution of disputes - *Assumptions for resolution of disputes were not included in Alternative 1 and at this time would not appear to affect environmental conditions.*
- C The April 2000 proposal includes provisions for expansion of the CVP service areas by the existing CVP water contractors - *The study area for the long-term contract renewal process is defined by the existing service area boundaries. Expansion of the service area boundaries would be a new Federal Action and would require separate environmental documentation.*

The April 2000 proposal did include several provisions that were different than the assumptions for NAA and those provisions are included in Alternative 1, as summarized in Table 2-1. The April 2000 proposal also included several provisions that involve specific language changes that would not significantly modify CVP operations in a manner that would affect the environment as compared to the No-Action Alternative but could affect specific operations of a contractor, as described in Table 2-1.

It should be noted that the tiered pricing requirements (including unit prices for CVP water) and definition of municipal/industrial users in Alternative 1 would be the same as in the NAA.

Alternative 2

Alternative 2 is based upon the proposal presented by Reclamation to CVP water service contractors in November 1999. However, there were several provisions included in the November 1999 proposal that are not included in Alternative 2. These provisions would constitute a separate Federal action, as described below.

- C The November 1999 proposal includes provisions for the contractor to request approval from Reclamation of proposed water transfers - *Water transfers were not included in Alternative 2 because such actions cannot now be definitely described and essentially constitute a separate Federal action and require separate environmental documentation.*
- C The November 1999 proposal includes provisions for transfer of operations and maintenance third parties - *Operations and maintenance transfers were not included in Alternative 2 because these actions would be a separate Federal action and require separate environmental documentation.*

The November 1999 proposal did include several provisions that were different than the assumptions for NAA and included in Alternative 2, as summarized below and in Table DA-1. The primary differences are related to tiered pricing and the definition of municipal and industrial users.

Tiered Water Pricing. Tiered water pricing in Alternative 2 is based upon a definition of a "Category 1" and "Category 2" water supplies. "Category 1" is defined as the quantity of CVP water that is reasonably likely to be available for delivery to a contractor and is calculated on an annual basis as the average quantity of delivered water during the most recent 5 year period. For the purposes of this Alternative, the "Category 1" water supply is defined as the "contract total". "Category 2" is defined as that additional quantity of CVP water in excess of Category 1 water that may be delivered to a contractor in some years. Under Alternative 2, the first 80% of Category 1 volume would be priced at the applicable Contract Rate for the CVP. The next 10% of the Category 1 volume would be priced at a rate equal to the average between the Contract Rate and Full Cost Rate as defined by Reclamation law and policy. The final 10% of the Category 1 volume would be priced at the Full Cost Rate as required by the CVPIA. All Category 2 water, when available, would be priced at Full Cost Rate (Figure DA-1). It should be noted that Category 1 and Category 2 volumes will change every year based upon the average deliveries for the "most recent 5 years," with limited exceptions, based upon the findings of the water needs assessment. Alternative 2 assumes the sum of Category 1 and Category 2 water is equal to the maximum quantity included in the contractors' existing water service contract. The quantity is the same as the NAA and Alternative 1. The terms "Contract Rate" and "Full Cost Rate" are discussed under Tiered Pricing for the NAA. The same Ability-to-Pay adjustments would be applicable to Restoration Payments and tiered water rates as described in the NAA.

Water Rate	Contractual Entitlement	Water Classification
	Full Contract Amount	
Tier 3 Full Cost Rate	Threshold	Category 2
	90 % of Threshold	Category 1
Tier 2 Avg. of Contract Rate and Full Cost Rate	80 % of Threshold	
Tier 1 Contract Rate		

Figure DA-1
Category and Tier Water Pricing Relationship

The prices of CVP water used in Alternative 2 are based upon irrigation and municipal/industrial CVP water rates presented in the November 17, 1999 Financial Workshop Handouts 1 and 2.

Definition of Municipal and Industrial Users. The definition of municipal and industrial water includes all tracts less than or equal to 5 acres unless the Contracting Officer is satisfied that the use of such water meets the definition of "Irrigation Water".

ALTERNATIVES CONSIDERED BUT ELIMINATED

Nonrenewal of Long-Term Contracts

Nonrenewal of existing contracts is considered infeasible based on Section 3404(c) of the CVPIA. This alternative was considered but eliminated from analysis in this EA because Reclamation has no discretion not to renew the contracts.

Reduction in Contract Amounts

Reduction of contract amounts was considered in certain cases but rejected from analysis. The reason for this was twofold. Water needs analyses have been completed for all contracts and in almost all cases the needs exceed or equal the current total contract amount. Secondly, in order to implement good water management, the contractors need to be able to store or immediately use water available in wetter years when more water is available. By quantifying contract amounts in terms of the needs analyses and the CVP delivery capability, the contractors can make their own economic decisions. Allowing the contractors to retain the full water quantity gives the contractors assurance that the water will be available to them for storage investments. In addition the CVPIA, in and of itself, achieves a balance in part through its dedication of significant amounts of CVP water and actions to acquire water for environmental purposes.

SELECTION OF THE PREFERRED ALTERNATIVE

It is anticipated that the final contract language and the long-term contract renewal Preferred Alternative will represent a negotiated position between Alternatives 1 and 2. Therefore, it is anticipated that the impacts will be either equal to or less than those identified for Alternative 1, Alternative 2, or NAA. A summary of the alternative impacts is provided in Table DA-2.

Table DA-1
Comparison of Contract Provisions Considered in Alternatives

Provision	No Action Alternative	Alternative 1	Alternative 2
	Based on PEIS and Interim Contracts	Based on April 2000 Proposal	Based on November 1999 Proposal
Explanatory Recitals	Assumes water rights held by CVP from SWRCB for use by water service contractors under CVP policies	Assumes CVP Water Right as being held in trust for project beneficiaries that may become the owners of the perpetual right.	Same as NAA
	Assumes that CVP is a significant part of the urban and agricultural water supply of users	Assumes CVP as a significant, essential, and irreplaceable part of the urban and agricultural water supply of users	Same as NAA
	Assumes increased use of water rights, need to meet water quality standards and fish protection measures, and other measures constrained use of CVP	Assumes that CVPIA impaired ability of CVP to deliver water	Same as NAA
	Assumes the need for the 3408(j) study	Assumes implementation of yield increase projects per 3408(j) study	Same as NAA
	Assumes that loss of water supply reliability would have impact on socioeconomic conditions and change land use	Assumes that loss of water supply reliability would have significant adverse socioeconomic and environmental impacts in CVP service area	Same as NAA
Definitions			
"Charges"	Charges defined as payments required in addition to Rates	Assumes rewording of definition of Charges to exclude both Rates and Tiered Pricing Increments	Same as NAA
"Category 1 and Category 2"	Tiered Pricing as in PEIS	Not included	Tiered Pricing for Categories 1 and 2
"Contract Total"	Contract Total described as Total Contract	Same as NAA	Described as basis for Category 1 to calculate Tiered Pricing
"Landholder"	Landholder described in existing Reclamation Law	Assumes rewording to specifically define Landholder with respect to ownership, leases, and operations	Assumes rewording to specifically define Landholder with respect to ownership and leases

Table DA-1
Comparison of Contract Provisions Considered in Alternatives

Provision	No Action Alternative	Alternative 1	Alternative 2
	Based on PEIS and Interim Contracts	Based on April 2000 Proposal	Based on November 1999 Proposal
"M&I Water"	Assumes rewording to provide water for irrigation of land in units less than or equal to 5 acres as M&I water unless Contracting Officer satisfied use is irrigation	M&I water described for irrigation of land in units less than or equal to 2 acres	Same as NAA
Terms of Contract - Right to Use Contract	Assumes that contracts may be renewed	States that contract shall be renewed	Same as NAA
	Assumes convertibility of contract to a 9(d) contract same as existing contracts	Includes conditions that are related to negotiations of the terms and costs associated with conversion to a 9(d) contract	Same as NAA
Water to be Made Available and Delivered to the Contractor	Assumes water availability with existing conditions	Similar to NAA	Actual water availability in a year is unaffected by Categories 1 and 2.
	Assumes compliance with Biological Opinions and other environmental documents for contracting	Not included	Same as NAA
	Assumes that current operating policies strive to minimize impacts to CVP water users	Assumes that CVP operations will be conducted in a manner to minimize shortages and studies to increase yield shall be completed with necessary authorizations	Same as NAA
Time for Delivery of Water	Assumes methods for determining timing of deliveries as in existing contracts	Assumes minor changes related to timing of submittal of schedule	Same as NAA
Point of Diversion and Responsibility for Distribution of Water	Assumes methods for determining point of diversion as in existing contracts	Assumes minor changes related to reporting	Same as NAA
Measurement of Water Within District	Assumes measurement for each turnout or connection for facilities that are used to deliver CVP water as well as other water supplies	Assumes measurement at delivery points	Assumes similar actions in NAA but applies to all water supplies
Rates and Method of Payment for Water	Assumes Tiered Pricing is total water quantity. Assumes advanced payment for rates for 2 months.	Assumes Tiered Pricing is total water quantity. Assumes advanced payment for rates for 1 month.	Assumes Tiered Pricing is total water quantity. Assumes advanced payment for rates for 6 months.

Table DA-1
Comparison of Contract Provisions Considered in Alternatives

Provision	No Action Alternative	Alternative 1	Alternative 2
	Based on PEIS and Interim Contracts	Based on April 2000 Proposal	Based on November 1999 Proposal
Non-interest Bearing Operation and Maintenance Deficits	Assumes language from existing contracts	Same as NAA	Same as NAA
Sales, Transfers, or Exchanges of Water	Assumes continuation of transfers with the rate for transferred water being the higher of the sellers or purchasers CVP cost of service rate	Assumes continuation of transfers with the rate for transferred water being the purchasers CVP cost of service rate	Same as NAA
Application of Payments and Adjustments	Assumes payments will be applied as in existing contracts	Assumes minor changes associated with methods described for overpayment	Same as NAA
Temporary Reduction - Return Flows	Assumes that current operating policies strive to minimize impacts to CVP water users	Assumes minor changes associated with methods described for discontinuance or reduction of payment obligations	Same as NAA
Constraints on Availability of Project Water	Assumes that current operating policies strives to minimize impacts to CVP water users	Assumes Contractors do not consent to future Congressional enactments which may impact them	Same as NAA
Unavoidable Groundwater Percolation	Assumes that some of applied CVP water will percolate to groundwater	Same as NAA	Same as NAA
Rules and Regulations	Assumes that CVP will operate in accordance with then-existing rules	Assumes minor changes with right to non-concur with future enactments retained by Contractors	Same as NAA
Water and Air Pollution Control	Assumes that CVP will operate in accordance with then existing rules	Same as NAA	Same as NAA
Quality of Water	Assumes that CVP will operate in accordance with existing rules without obligation to operate towards water quality goals	Same as NAA	Same as NAA
Water Acquired by the Contractor Other than from the United States	Assumes that CVP will operated in accordance with existing rules	Assumes changes associated with payment following repayment of funds	Same as NAA

Table DA-1
Comparison of Contract Provisions Considered in Alternatives

Provision	No Action Alternative	Alternative 1	Alternative 2
	Based on PEIS and Interim Contracts	Based on April 2000 Proposal	Based on November 1999 Proposal
Opinions and Determinations	PEIS recognizes that CVP will operate in accordance with existing rules	Assumes minor changes with respect to references to the right to seek relief	Same as NAA
Coordination and Cooperation	Not included	Assumes that coordination and cooperation between CVP operations and users should be implemented and CVP users should participate in CVP operational decisions	Not included
Charges for Delinquent Payments	Assumes that CVP will operate in accordance with existing rules	Same as NAA	Same as NAA
Equal Opportunity	Assumes that CVP will operate in accordance with existing rules	Same as NAA	Same as NAA
General Obligation	Assumes that CVP will operate in accordance with existing rules	Similar to NAA	Same as NAA
Compliance with Civil Rights Laws and Regulations	Assumes that CVP will operate in accordance with existing rules	Same as NAA	Same as NAA
Privacy Act Compliance	Assumes that CVP will operate in accordance with existing rules	Same as NAA	Same as NAA
Contractor to Pay Certain Miscellaneous Costs	Assumes that CVP will operate in accordance with existing rules	Similar to NAA	Same as NAA
Water Conservation	Assumes compliance with conservation programs established by Reclamation and the State	Assumes conditions similar to NAA with the ability to use State standards which may or may not be identical to Reclamation's requirements	Same as NAA
Existing or Acquired Water or Water Rights	Assumes that CVP will be operated in accordance with existing rules	Same as NAA	Same as NAA
Operation and Maintenance by Non-federal Entity	Assumes that CVP will operate in accordance with existing rules and no additional changes to operation responsibilities under this alternative	Assumes minor changes to language that would allow subsequent modification of operational responsibilities	Assumes minor changes to language that would allow subsequent modification of operational responsibilities

Table DA-1
Comparison of Contract Provisions Considered in Alternatives

Provision	No Action Alternative	Alternative 1	Alternative 2
	Based on PEIS and Interim Contracts	Based on April 2000 Proposal	Based on November 1999 Proposal
Contingent on Appropriation or Allotment of Funds	Assumes that CVP will operate in accordance with existing rules	Assumes minor changes to language	Same as NAA
Books, Records, and Reports	Assumes s that CVP will operate in accordance with existing rules	Assumes changes for record keeping for both CVP operations and CVP users	Same as NAA
Assignment Limited	Assumes that CVP will operate in accordance with existing rules	Assumes changes to facilitate assignments	Same as NAA
Severability	Assumes that CVP will operate in accordance with existing rules	Same as NAA	Same as NAA
Resolution of Disputes	Not included	Assumes a Dispute Resolution Process	Not included
Officials Not to Benefit	Assumes that CVP will operate in accordance with existing rules	Same as NAA	Same as NAA
Changes in Contractor's Service Area	Assumes no change in CVP water service areas absent Contracting Officer consent	Assumes changes to limit rationale used for non-consent and sets time limit for assumed consent	Same as NAA
Notices	Assumes that CVP will operate in accordance with existing rules	Same as NAA	Same as NAA
Confirmation of Contract	Assumes Court confirmation of contract	Not included - Assumption is Court confirmation not required	Same as NAA

Table DA-2
Summary of Potential Alternative Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
Surface Water	Contractors will continue to use available surface water and pump ground water. The surface water available to the contractors is reduced from the historic levels because of pumping constraints at the Delta and the impacts of this reduction are described in the PEIS.	Similar effect as the NAA.	<p>In most years this alternative would result in little or no change in water use from the NAA. In other years, Cross Valley Contractors would tend to switch from ground water to surface water. This change will not have an effect on the San Joaquin River flows or other streams in the region. Changes in surface water use will not result in additional diversions from the Delta or changes to San Luis reservoir storage.</p> <p>Alternative 2 will not affect the deliveries in the Friant-Kern Canal or storage in Millerton Lake.</p>
Water Supply	Historic mixed uses of both ground water and CVP surface water in the Cross Valley Canal area are expected to continue. More emphasis on ground water use is expected during periods when CVP surface water is limited or expensive. Overall, the diversions from the Delta to meet south of Delta demands is less under the NAA than historically observed.	Similar effect as the NAA.	<p>Minimal changes are anticipated for irrigated acres in most year types for most of the subbasins.</p> <p>Contractors may switch from ground water to surface water in certain years because of tiered water pricing. The additional CVP water purchased by the Contractors would come from San Luis Reservoir and the Delta. The total diversions from the Delta are not anticipated to change with the tiered pricing.</p> <p>Some Contractors receive water from Millerton Lake through an exchange with Arvin Edison Water Storage District. Changes in CVP water management because of this alternative would not affect this exchange.</p>

Table DA-2
Summary of Potential Alternative Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
Ground Water	<p>During dry conditions, ground water usage increases in response to decreases in surface water supplies. Contractors return to greater surface water usage after the dry conditions end.</p> <p>It is assumed that Contractors will return to greater use of CVP water in years when water is available from the Delta at the conclusion of the dry period.</p>	Similar effect as the NAA.	A single year of decreased ground water pumping will not adversely or beneficially affect the ground water basin. Over the long term, the ground water use in subbasin 17 would decrease. This would have a beneficial impact on the ground water basin.
Water Quality	<p>Water quality in the rivers and ground water of the Cross Valley Contractor service area under the NAA is not anticipated to change from past conditions. Factors that tend to influence water quality, such as agricultural runoff, will be similar to historic conditions. However, the average delivery south-of-the-Delta is projected to decline from historic conditions. This may increase ground water demands and result in application of water of a lesser quality than surface water. Continued application of this water under the NAA may influence water quality over the long term.</p>	Similar effect as the NAA.	A decrease in ground water pumping in subbasins 17, 18, and 20 is anticipated. This decrease in pumping should have a small, but unquantifiable, benefit to water quality as farmers switch to better-quality surface water.
Fisheries	<p>Water use is expected to continue as in the past using both CVP surface water supplies and ground water. Ground water has typically been more important during dry years when CVP water is less available. Therefore no impacts on fisheries are predicted.</p>	Similar effect as the NAA.	Water would remain in Millerton lake until purchased by Cross Valley users. Water not purchased would likely be picked up by other users. it could result in different timing in the movement of water in the Cross Valley Canal.

Table DA-2
Summary of Potential Alternative Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
Land Use	The estimated irrigated acres in the three subregions for an average water year is 1,055,500 acres. In a wet year the total irrigated acres increases by about 2,800 acres (0.3%). In a dry year the irrigated acres decrease by about 23,600 acres (2.2%).	Similar effect as the NAA.	Compared to the NAA, in average and dry years there is no change in irrigated acreage. In wet years there is a decrease in irrigated acres by 1,200 (0.1%).
Biological	Existing Cross Valley management will continue under current conditions. No impacts to vegetation and wildlife are expected, since no additional infrastructure (e.g., dams, increased dam heights, canals, etc.) will be constructed. Additionally, under this alternative, there will be no increase in deliveries and no conversion of existing natural habitat into farmland.	Similar effect as the NAA.	<p>The additional water cost could result in an increase in the amount of lands left fallow. If fallowed lands are restored to native conditions, they could provide habitat for regional vegetation and wildlife.</p> <p>A decrease in some agricultural crops (e.g., alfalfa and grain crops) however, could potentially impact the amount of nesting and feeding habitat for wildlife in the area. While a reduction in the amount of alfalfa or grain acreage could impact some species, restoration of these lands to a more natural condition would likely provide benefits to listed and other species considered sensitive.</p> <p>As the cost of water increases, the opportunity to provide wetland habitat by private landowners generally decreases. This could result in a decrease in availability of wetland habitat in the Cross Valley region. However, if water use decreases, more water may be available to flow</p>

Table DA-2
Summary of Potential Alternative Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
			down the San Joaquin, Chowchilla, and Fresno Rivers. Increased flows along these waterways would enhance the riparian zones, resulting in enhanced habitat quality for wildlife.
Recreational	The existing Cross valley facilities will continue to operate under current conditions. The recreational resources do not change.	Similar effect as the NAA.	Similar to the NAA.
Socioeconomic	Gross revenue for the Cross Valley subregions is about \$2.1 million and produces about 22% of the valley-wide net income.	Similar effect as the NAA.	A reduction of \$1 million is estimated for gross revenue or less than 1% in all economic scenarios ending in a wet year. The maximum net revenue changes less than 1% in all scenarios. Total employment output and place-of-work income impact is less than 1%.
Cultural	The NAA would not result in direct impacts to eligible or cultural resources. Water apportioned under the NAA may be used to alter the use of a landscape, either through inundation, irrigation-related construction, or some other change which could impact cultural resources. The entities responsible at this level for potential impacts to cultural resources are the contracting agencies – the individual water districts.	Similar effect as the NAA.	Similar to the NAA.
Social Conditions	The existing Cross Valley operations do not change and social conditions are unchanged.	Similar effect as the NAA.	Similar to the NAA.
Air Quality	The existing Cross Valley operations do not change and air quality is unchanged.	Similar effect as the NAA.	Similar to the NAA.

Table DA-2
Summary of Potential Alternative Impacts

Resources	No Action Alternative	Alternative 1	Alternative 2
Geology and Soils	The existing Cross Valley operations do not change and geology and soil conditions are unchanged.	Similar effect as the NAA.	Over the long term the ground water use in subbasin 17 would decrease. Retired or fallowed agricultural production lands will have a cover crop planted in the last year of cultivation.
Visual	The existing Cross Valley operations do not change and visual conditions are unchanged.	Similar effect as the NAA.	Similar to the NAA.

SECTION 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This section presents the existing conditions for the environmental resource topics and discusses the impacts expected to occur as a result of implementing the LTCRs. The environmental consequences and mitigation measures are provided for the NAA and Alternatives 1 and 2 considered in the Study Area as described under the affected environment. The period of analysis was conducted for the projected conditions in the Year 2026, the first period of renewal for the 25-year LTCRs. Considering the purpose of this project is to renew long-term water service contracts, the resource areas considered relevant and appropriate for the EA included the following:

- Surface Water
- Water Supply
- Groundwater Resources
- Water Quality
- Fisheries Resources
- Land Use Resources
- Biological Resources
- Recreational Resources
- Socioeconomic Resources
- Cultural Resources
- Social Conditions
- Air Quality
- Geology and Soils
- Visual Resources

SURFACE WATER

Affected Environment

Delta Diversions

Water deliveries to the Cross Valley Contractors originate at the Delta and are diverted through the Harvey O. Banks Pumping Plant of the SWP. Although the diversion occurs through SWP facilities, the water supply is part of the CVP and therefore subject to any limitations placed on CVP deliveries.

Each year on February 15th, Reclamation announces the delivery level for CVP water to the contractors. The delivery level for contractors south and north of the Delta will typically be different. Because deliveries throughout the CVP are influenced by the total available supply, contractors south of the Delta are influenced by the ability to convey the water south of the Delta. That is, limitations on the Tracy Pumping Plant and Harvey O. Banks Pumping Plant and available storage in San Luis Reservoir control

the amount of water that can be delivered south of the Delta. Recent constraints placed on export pumping through the Bay-Delta Plan Accord, endangered species actions, and the final decision on (b)(2) water all constrain the diversion of water at the CVP and SWP export facilities.

Cross Valley Contractors

Cross Valley Contractors are located within the Friant Division geographic service area receiving water from the Friant-Kern Canal. In 1975 the locally financed Cross Valley Canal was completed, bringing water from the California aqueduct through a series of six pump lifts to the east side of the southern San Joaquin Valley near the city of Bakersfield. The Cross Valley Contractors receive water from the Friant-Kern Canal via an exchange made possible by California Department of Water Resources (DWR) wheeling water through the SWP to the Cross Valley Canal.

DWR diverts water for the Cross Valley Contractors from the Delta at the Harvey D. Banks Pumping Plant, through the California Aqueduct, and to the SWP's portion of San Luis Reservoir. From San Luis Reservoir, the water is conveyed via the San Luis Canal to the Cross Valley Canal turnout in Kern County, and delivered to Arvin-Edison Water Storage District. Arvin-Edison Water Storage District and other districts take delivery of the Delta water, then "exchange" water under contract with Reclamation from the Friant Division with other Reclamation contractors on the Friant-Kern Canal. The Cross Valley Canal contracts are for an annual delivery of 128,300 af/yr of water, depending on availability.

Upper San Joaquin River

Runoff from the Sierra Nevada mountains in San Joaquin Valley occurs between late winter to early summer and fall. Above Friant Dam, the San Joaquin River drains an area of approximately 1,676 square miles and has an annual average unimpaired runoff of 1.7 million af/yr. The historical unimpaired runoff ranges from 0.4 to 4.6 million af/yr with a median of 1.4 million af/yr. Several reservoirs in the upper portion of the San Joaquin River watershed, including Mammoth Pool and Shaver Lake, are primarily used for hydroelectric power generation and have a combined storage capacity of approximately 620,000 af/yr.

The majority of the annual flow has been diverted in the Friant-Kern and Madera canals with peak monthly flows occurring in July. Average monthly releases from Friant Dam to the San Joaquin River since 1941 have included minimum releases to satisfy water rights above Gravelly Ford and flood control releases with minor contributions from agricultural and urban return flows (Figure SW-1).

San Joaquin River Below Friant Dam **Average Monthly Flow** **(cfs)**

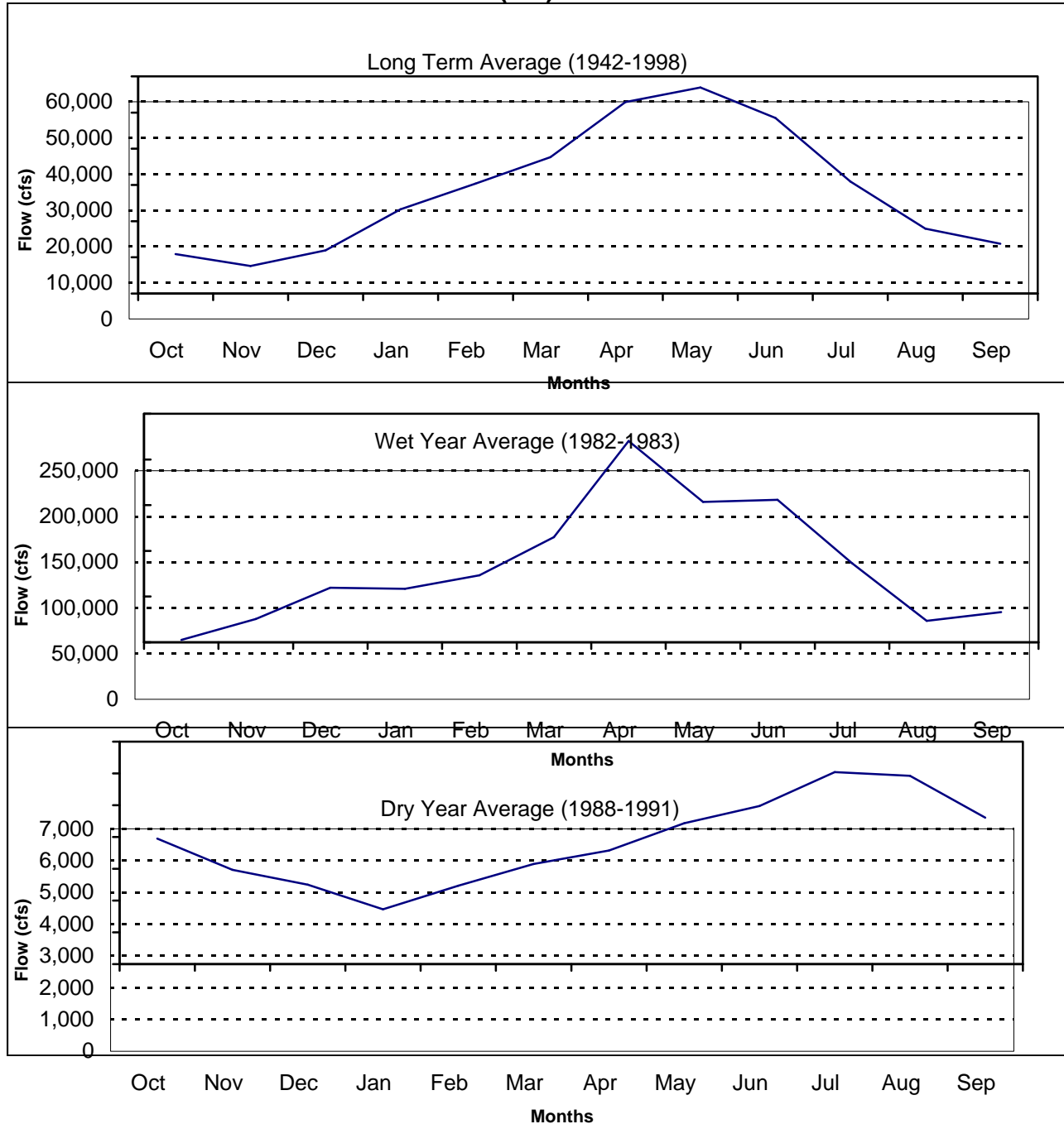


Figure SW-1
Average Monthly Flow of San Joaquin River
Below Friant Dam

Recently, the San Joaquin River Riparian Flow Pilot Project test program has increased flows of the San Joaquin River between Friant Dam and Mendota pool to provide benefits to riparian habitat. The pilot project has introduced enhanced riparian flows into reaches of the San Joaquin River that typically carry minimal flow. The limited flows below Friant Dam, which began July 3 1999, represent a one-time release into the channel that separates Fresno and Madera counties. As envisioned, the pilot project was a five-month water management regimen. Friant Division districts made approximately 35,000 af of water available for the pilot program in 1999. In addition, the U.S. Bureau of Reclamation approved the purchase and delivery of up to 15,000 af of CVP supplies as "replacement water" to make up for potentially significant river channel conveyance losses incurred between Friant Dam and Mendota Pool. The replacement water was also conveyed through the California Aqueduct for delivery into the Friant service area via the Cross Valley Canal. The project was contingent upon water exchanges to ensure no adverse impacts to Friant water users' supplies. A similar program was conducted in 2000.

San Joaquin River between Gravelly Ford and Fremont Ford

Gravelly Ford, located downstream of Friant Dam, is a sandy and gravelly section of the San Joaquin River that is subject to high river flow losses. The section of the San Joaquin River between Gravelly Ford and the Mendota Pool spans approximately 17 miles and is generally dry except when releases are made from Friant Dam for flood control.

During flood control operations, flood flows can be diverted to the Chowchilla Bypass up to its capacity of 6,500 cfs. The Chowchilla Bypass runs northwest, intercepts flows in the Fresno River, and discharges to the Chowchilla River. The East Side Bypass begins at the Chowchilla River and runs northwesterly to rejoin the San Joaquin River above Fremont Ford. Together, the Chowchilla and Eastside bypasses intercept flows of the San Joaquin, Fresno, and Chowchilla rivers, and other lesser east side San Joaquin River tributaries, to provide flood protection for downstream agricultural lands. These bypasses are located in highly permeable soils, and much of the water recharges groundwater.

Flows in the San Joaquin River that pass the Chowchilla Bypass enter the Mendota Pool. The Mendota Pool was formed in 1871 by the construction of Mendota Dam on the San Joaquin River by water rights holders, and is the point at which the San Joaquin River turns northward. The Mendota Pool has a capacity of approximately 50,000 af/yr and serves as a forebay for diversions to the Main and Outside canals. The Delta-Mendota Canal, which conveys CVP water from the Delta to San Joaquin River Exchange Contractors, terminates at the Mendota Pool. Water also enters Mendota Pool from the south, via Fresno Slough (sometimes referred to as James Bypass), which conveys overflows from the Kings River in the Tulare Lake Basin to the San Joaquin River.

Millerton Lake

Millerton Lake is formed by Friant Dam and has a capacity of 520,000 acre-feet. The Lake serves both as a flood control facility and a water supply facility. Operations are coordinated with upstream hydroelectric utility-owned reservoirs and the Army Corp of Engineers during flood periods. Up to 390,000 acre-feet per year of Millerton Lake is reserved for flood control storage. Part or all of the dedicated flood control storage may be used for conservation storage, depending on the time of year and the current flood hazard. Flood control operations of Millerton Lake are influenced by the storage available in upstream reservoirs (Figure SW-2). Water for the Cross Valley Contractors comes from Millerton Lake and is conveyed through the Friant-Kern Canal.

Friant-Kern Canals

Since completion of Friant Dam in 1941, the majority of the annual flow has been diverted to the 152 mile-long Friant-Kern Canal and the 36 mile-long Madera Canal. Millerton Lake storage is used to furnish an average annual supplemental canal side water supply of about 800,000 af of Class 1 and about 1,400,000 af of Class 2 water to the Friant-Kern Canal and Madera Canal.

The Friant-Kern Canal extends south from Friant Dam in Fresno County to Kern County near Bakersfield. The Canal diverts water to extensive areas in the Tulare Lake Basin, that lack, or are deficient in water supplies. Individual irrigation districts integrate CVP water supplies with water supplies from the Kings, Kaweah, Tule, and Kern rivers and through exchange agreements between Friant-Kern and Cross Valley Contractors.

Average Monthly Storage for Friant Dam (thousands of acre-feet)

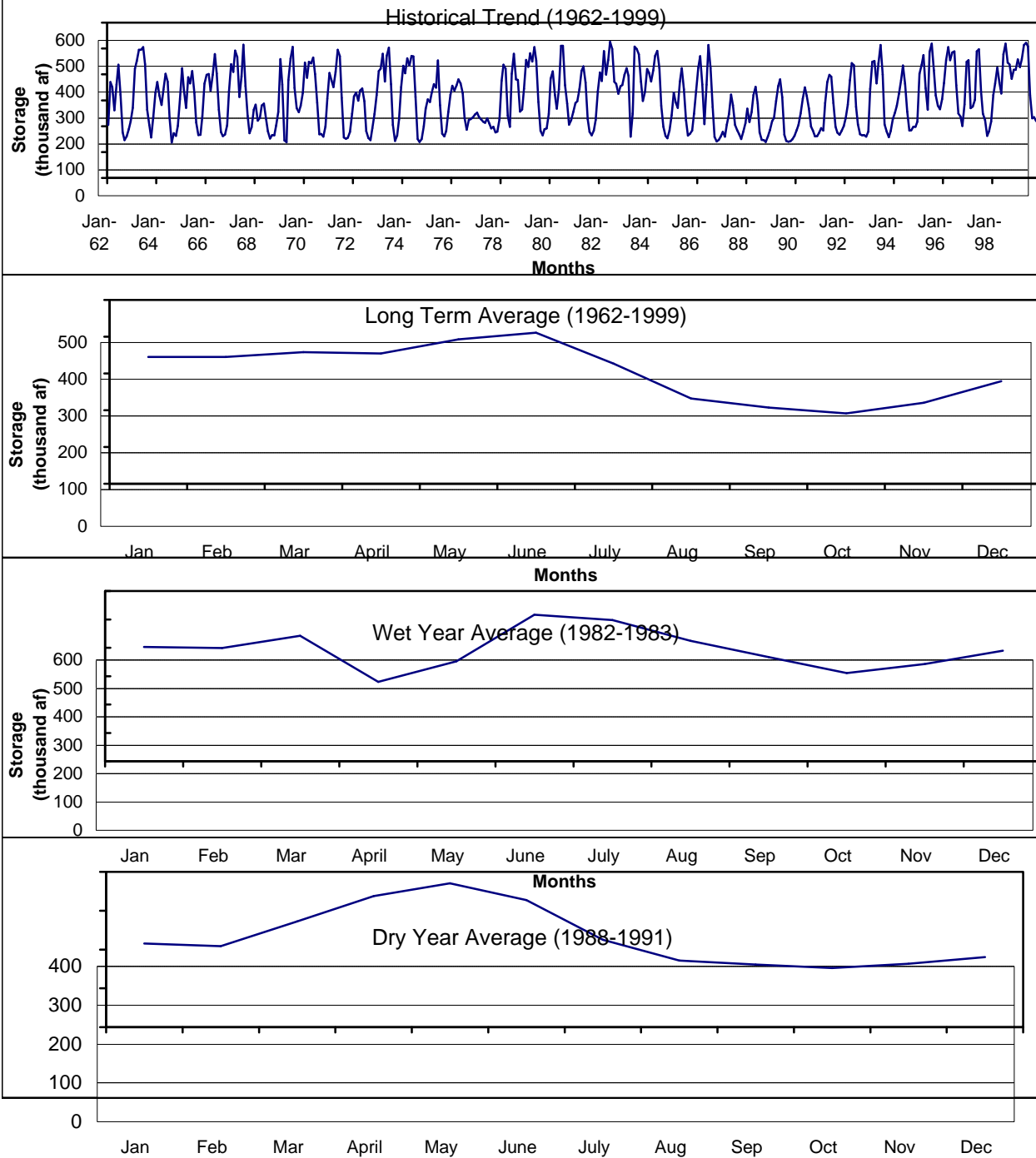


Figure SW-2
Average Monthly Storage for Millerton Lake

Environmental Consequences

There is the potential for changes in surface water flows as a result of this project because of changes in water use patterns and the use of surface water and groundwater.

No Action Alternative

Under the No Action Alternative (NAA), Cross Valley Contractors will continue to use available surface water and pump groundwater. The surface water available to the contractors is reduced from the historic levels because of pumping constraints at the Delta, the impacts of this reduction are described in the PEIS (Reclamation 1999).

Alternative 1

Alternative 1 has similar environmental effects as the NAA and therefore will not have an impact on the surface water resources of the Cross Valley service area or the Delta.

Alternative 2

The economic analysis of Alternative 2 indicates that in most years this alternative would result in little or no change in water use from the NAA. In other years, Cross Valley Contractors would tend to switch from groundwater to surface water (see Water Supply Section). This change will not have an effect on the flow regime of the San Joaquin River or other streams in the region. The change in surface water use will not result in additional diversions from the Delta from the diversions analyzed in the PEIS. San Luis reservoir storage will not change from the conditions described in the PEIS.

The surface water elevation in Millerton Lake is dependent upon the availability of surface runoff for the year, storage and discharge of upstream reservoirs, and the timing of demand for irrigation water. Cross Valley Contractors receive Millerton Lake water through an exchange with AEWS. Alternative 2 will not affect the deliveries in the Friant-Kern Canal or storage in Millerton Lake.

Cumulative Effects

The cumulative effects of all foreseeable projects will be to place additional demands on the available water supply. These projects may also put additional water in local rivers. Implementation of Alternatives 1 or 2 will not influence the cumulative effects of these other projects on water resources.

WATER SUPPLY

Affected Environment

Delta Diversions

Water deliveries to the Cross Valley Contractors originate at the Delta and are diverted through the Harvey O. Banks Pumping Plant of the SWP. Although the diversion occurs through SWP facilities, the water supply is part of the CVP and therefore subject to any limitations placed on CVP deliveries.

Cross Valley Contractors

Cross Valley Contractors are geographically located within the Friant Division service area and border many districts that receive water from the Friant-Kern Canal. In 1975, the locally financed Cross Valley Canal was completed, bringing water from the California Aqueduct through a series of six pump lifts to the east side of the southern San Joaquin Valley near the City of Bakersfield.

DWR diverts water for the Cross Valley Contractors from the Delta at the Harvey O. Banks Pumping Plant, and conveys the water through the California Aqueduct to the SWP's portion of San Luis Reservoir. From San Luis Reservoir, the water is conveyed via the California Aqueduct to the Cross Valley Canal turnout in Kern County, and delivered to AEWS. AEWS is a Friant Division contractor and receives its CVP water from Millerton Lake. AEWS takes delivery of the Delta water, then "exchanges" the Delta water for water it has under contract with Reclamation from the Friant Division. Pixley Irrigation District and Lower Tule River Irrigation District does not participate in the exchange with AEWS and transfers CVP water to another CVP water district(s). The Cross Valley Contractors rely on the Delta as the source of water but physically take delivery of water from Millerton Lake. The Cross Valley Canal contract is for an annual delivery of 128,300 af/yr of water, depending on availability (Table WS-1).

Table WS-1
Cross Valley Contractor Contracts

Cross Valley Contractors	CVP Maximum Contract Amount (af)
County of Fresno	3,000
Hills Valley Irrigation District	3,346
Kern-Tulare Water District	40,000
Lower Tule River Irrigation District	31,102
Pixley Irrigation District	31,102
Rag Gulch Water District	13,300
Tri-Valley Water District	1,142
County of Tulare	5,308

Source: U.S. Department of Interior, Bureau of Reclamation

Friant-Kern Canal

Since completion of the Friant Dam in 1941, the majority of the annual flow of the San Joaquin River at Friant Dam has been diverted down the 152 mile-long Friant-Kern Canal and the 36 mile-long Madera canal. Millerton Lake storage is used to furnish an average annual supplemental canal side water supply of about 800,000 acre-feet of Class 1 and about 1,400,000 acre-feet of Class 2 water to the Friant-Kern and Madera Canals.

The Friant-Kern Canal extends south from Friant Dam in Fresno County to Kern County near Bakersfield. The Friant-Kern Canal exports water to extensive areas in the Tulare Basin, which are lacking or are deficient in water supplies. Individual irrigation districts integrate CVP water supplies with water supplies from the Kings, Kaweah, Tule, and Kern rivers and through exchange agreements between Friant-Kern and Cross Valley Contractors.

Environmental Consequences

Changing the price structure of water delivered to Cross Valley Contractors could influence the amount of CVP water purchased in a given year. However, water diversions from the Delta to meet the demands south of the Delta are projected to decrease from historic levels because of implementation of CVPIA (Reclamation, 1999). A decrease from historic levels would increase the scarcity of water, and water users would adjust water use practices to accommodate the supply. The potential environmental effects are described below.

No Action Alternative

Based on the historic use of both ground water and surface water in the Cross Valley Contractor area, contractors are expected to continue mixed use of CVP surface water and groundwater, with greater emphasis on ground water use during periods when CVP surface water is limited or expensive. The water supply to Cross Valley Contractors under the NAA was described in the PEIS. Overall, the diversions from the Delta to meet south of Delta demands is less under the NAA than historically observed (Reclamation 1999).

Reclamation prepared water needs assessments for the Cross Valley Contractors to evaluate the water supply needs in the future (2026). This analysis resulted in an estimate of about 158,200 af of unmet demand in 2026 (Table WS-2). That is, there is an additional need for water in the Cross Valley Contractor service area, independent of this project.

Table WS-2
Water Needs Assessments

Cross Valley Contractor	Maximum Water Contract Amount (acre-feet/yr)	Unmet Demand (acre-feet)
Tri-Valley WD	1,142	1,142
Fresno, County of	3,000	1,122
Hills Valley ID	3,346	3,092
Kern-Tulare WD	40,000	7,517
Lower Tule River ID	31,102	23,318
Pixley ID	31,102	112,507
Rag Gulch WD	13,300	9,460
Tulare, County of	5,308	**
Total	128,300	158,158

Source: U.S. Department of Interior, Bureau of Reclamation

Note:

** Insufficient information provided by contractor for Reclamation Water Needs Assessment

A positive unmet demand indicates more demand than supply. Conversely, a negative number indicates more supply than demand.

** If the Unmet Demand is within 25 percent of the contract supply for contracts of 5,000 to 20,000 acre-feet, then it is assumed that the “surplus” increment can be put to beneficial use. If the Unmet Demand is within 10 percent of the contract supply for contracts greater than 20,000 acre-feet, then it is assumed that the “surplus” increment can be put to beneficial use. For contracts less than 5,000 acre-feet, it was determined that the full amount could be put to beneficial use and a needs assessment was not done.

Alternative 1

The environmental effects of Alternative 1 are similar to the NAA and therefore there are no significant effects from the implementation of this alternative.

Alternative 2

The economic conditions and water use under this alternative were analyzed with the CVPM model (see Socioeconomics section). The analysis summarized the changes in irrigated acreage by subbasins as compared to irrigated acreage under the NAA. The results for the subbasins relevant to the Cross Valley Contractor service area are summarized in Table WS-3. The irrigation districts that correspond to the subbasins are shown in Table WS-4. This particular analysis illustrates that minimal changes are anticipated for most year types.

Table WS-3
Changes in Water Use in the CVPM Subbasins
(Changes from NAA in thousands of acre-feet/year)

Changes in Water Use for a Average Year that Follows a 5-Year Period that is:

CVPM Subbasin s	Average		Wet		Dry	
	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water
17	3.9	-3.8	3.8	-3.8	4.0	-3.9
18	0.0	0.0	0.0	0.0	0.1	-0.1
20	0.1	-0.1	0.1	-0.1	-0.2	0.1

Changes in Water Use for a Wet Year that Follows a 5-Year Period that is:

CVPM Subbasin s	Average		Wet		Dry	
	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water
17	7.4	-7.4	7.3	-7.2	7.4	-7.4
18	0.0	-4.0	0.0	-4.0	0.1	-3.8
20	0.1	0.0	0.0	0.0	-0.1	0.0

Changes in Water Use for a Dry Year that Follows a 5-Year Period that is:

CVPM Subbasin s	Average		Wet		Dry	
	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water
17	0.0	0.0	0.0	0.0	0.1	0.0
18	0.0	0.0	0.0	0.0	0.1	0.0
20	0.0	0.0	0.0	0.0	-0.1	0.0

Note: A positive number represents an increase in the use of water and a negative number represents a decrease in water use from the NAA.

Table WS-4
Irrigation Districts within CVPM Economic Subbasins

CVPM Subbasin	Cross Valley Contractor
17	Hills Valley, Tri-Valley.
18	County of Fresno, Lower Tule River Irrigation District, Pixley Irrigation District, Rag Gulch, County of Tulare, Kern-Tulare Water District
20	Ray Gulch, Kern-Tulare Water District

The largest change in annual water use is projected to occur in wet years. A change is also simulated in average years for subbasin 17. The change is up to 7,400 af for subbasin 17 in a wet year following a period of 5 dry year. The change reflects a switch from groundwater to surface water for that combination of year-type and previous five years, but not a reduction in water use.

Impact Change in CVP Water Use in Certain Years

The Cross Valley Contractors may switch from surface water to ground water in certain years because of tiered water pricing. The additional CVP Water purchased by the Cross Valley Contractors would come from San Luis Reservoir and the Delta. This does not represent a new water supply, but rather, part of the water supply described in the PEIS. Overall, the diversion from the Delta would not change because of a one-year increase in CVP water use in the Cross Valley Contractor service area. The total diversions from the Delta are not anticipated to change with the tiered pricing with no impact anticipated. The Cross Valley Contractors receive water from Millerton Lake through an exchange with AEWS and other districts. Changes in CVP water use because of this alternative would not affect this exchange.

Cumulative Effects

Cumulative Effects of No Action, Alternative 1, and 2

Based on historical trends in surface water use south of the Delta and information presented in the CVPM simulations there are no projected impacts on water supply and thus no contribution to cumulative effects on the water supply.

GROUND WATER RESOURCES

Affected Environment

The Cross Valley Contractors are located in the Tulare Lake ground water hydrologic region. In the Tulare Lake Region, water users are located in the Kings, Kaweah, Tule, and northern portion of the Kern County subbasins.

Recharge of the semi-confined aquifer in the region is primarily derived from seepage from streams and canals, infiltration of applied water, and subsurface inflow. Precipitation on the valley floor provides some recharge, but only in wet years. Seepage from streams and canals is highly variable depending on

annual hydrologic conditions. Recharge to the lower confined aquifer takes place largely through lateral inflow from the semi-confined aquifer.

Ground Water Storage and Production

The usable storage capacity of the Tulare Lake Region is about 28 million af. The most recent estimate for ground water extraction without lowering ground water levels over the long-term (perennial yield) is approximately 4.6 million acre-feet for the Tulare Lake Region. This perennial yield is directly dependent upon the amount of recharge received by the ground water basin, which may be different in the future than it has been in the past.

Ground water pumping ranged from 1.6 million acre-feet in 1922 to 4.7 million acre-feet in 1977. Ground water pumping has been rising steadily through the 1970s, and has varied greatly from year to year depending on hydrologic conditions. The largest year-to-year fluctuation occurred during the 1976 - 1977 drought period. Immediately following the drought, hydrologic wet and above normal conditions for the years 1978 to 1980, resulted in reduced pumping. However, urban growth during the 1980s has contributed to an increase in ground water use. In addition, increased ground water pumping in the late-1980s and early-1990s occurred as a result of reduced surface water deliveries to CVP water users due to the imposition of environmental requirements on the operation of surface water facilities, and critically dry hydrologic conditions during the 1987 to 1992 drought period. DWR estimated recent ground water pumping for 1990 conditions (normalized) in the Tulare Lake Region at 5.2 million acre-feet. This exceeds the estimated perennial yield in the Tulare Lake Region by approximately 630,000 af. All of the subbasins within Tulare Lake Region experience some overdraft.

During the 10-year period from spring 1970 to spring 1980, semi-confined ground water levels generally dropped in the Tulare Lake Region. In portions of Fresno, Kings, Kern, and Tulare counties, semi-confined ground water levels dropped as much as 50 feet since spring 1970. The semi-confined aquifer in the Tulare Lake Region showed little change between spring 1980 and spring 1988.

The California Department of Water Resources collects and summarizes ground water data for wells across the Tulare Lake Basin. These data show the historical trends in ground water elevation for the basins in the Cross Valley Contractor service area (Figure GW-1). The data is subdivided into several basins that are defined by geologic and hydrologic conditions. The subbasins and the associated water districts are shown in Table GW-1.

Table GW-1**Groundwater Subbasins and Water Service Areas in the Cross Valley Contractor Service Area**

Groundwater Subbasin	Water/Irrigation District
Kings Basin	County of Fresno Hills Valley Irrigation District Tri Valley Water District
Kaweah Basin	Visalia, City of
Tule Basin	Pixley Irrigation District Rag Gulch Water District Lower Tule River Irrigation District
Kern County	Kern-Tulare Water District

Kings Basin

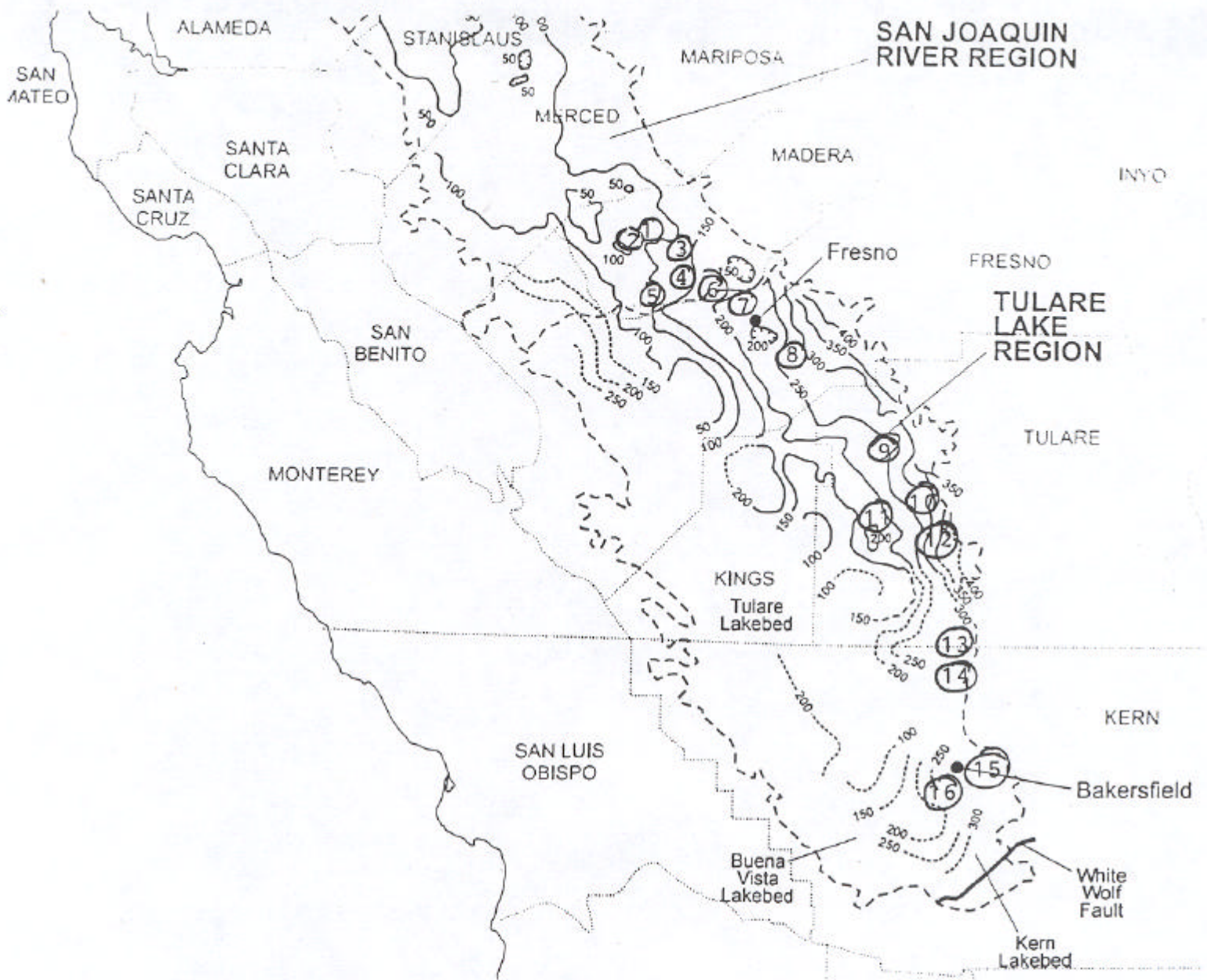
The Kings Basin includes the area around Fresno, extending to the foothills. The water supply for this basin is the Kings and San Joaquin Rivers. The basin declined following the drought in the early 1990's and has not yet recovered. The portion of the basin near Orange Cove declined during the drought but has recovered to pre-drought conditions (Figure GW-2).

Kaweah Basin

The Kaweah Basin encompasses the area around the City of Visalia and is supplied from the Kaweah River. Ground water levels decline over 20 feet during the drought but have recovered somewhat. North of Visalia, ground water levels have not completely recovered (Figure GW-3).

Tule Basin

The Tule Basin includes the area from Porterville to Delano and is supplied from the Tule River. Ground water levels in the Tule Basin declined during the drought but have recovered somewhat. Near Delano however, the ground water elevation remains about 20 feet lower than the pre-drought conditions (Figure GW-4).

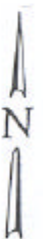


NOTE: NUMBERS REFER TO APPROXIMATE LOCATION OF GROUND WATER WELL

LEGEND:	
	Unconfined Groundwater Level Contour (ft msl)
	(contours dashed where inferred)
	Alluvial Boundary

Source: Reclamation, 1999

FIGURE GW-1
MONITORING WELLS IN THE SAN JOAQUIN VALLEY



Kern County Basin

The Kern County Basin includes the area south of Bakersfield and is supplied from the Kern River (Figure GW-5). The basin declined steadily until the mid 1970's when it began to recover. The basin declined in the early 1990's in response to drought conditions but has begun to recover.

Environmental Consequences

Typically, contractors supplement CVP surface water by pumping and applying ground water. Even during times of normal surface water availability, a number of areas within the service area require supplemental ground water to meet their irrigation needs. While the general trend for the past 50 years throughout the region has been one of declining ground water elevations, many of the major ground water aquifers in the area experienced dramatic drawdown during the late-1980s and early-1990s (Figures GW-1 to GW-5). While most of these aquifers have begun to recover to near pre-drawdown levels, the recovery rates have been widely variable. Furthermore, data from monitoring wells indicate that recovery from the late-1980s early-1990s drawdown has not occurred in some areas. In these areas, ground water elevations remain near the historic low levels reached during the dry period in the early 1990's.

As discussed in the Water Supply section, both the volume pumped and the overall requirement for supplemental ground water are anticipated to vary on both regional and sub-regional (local) bases depending on the combination of years. Overall, however, the CVPM simulations indicate that localized changes in ground water pumping in one area will be offset by changes in use of CVP water and reduced pumping elsewhere in the region; the net result being no change in ground water basin status compared to the current water distribution and use program.

Chowchilla Basin

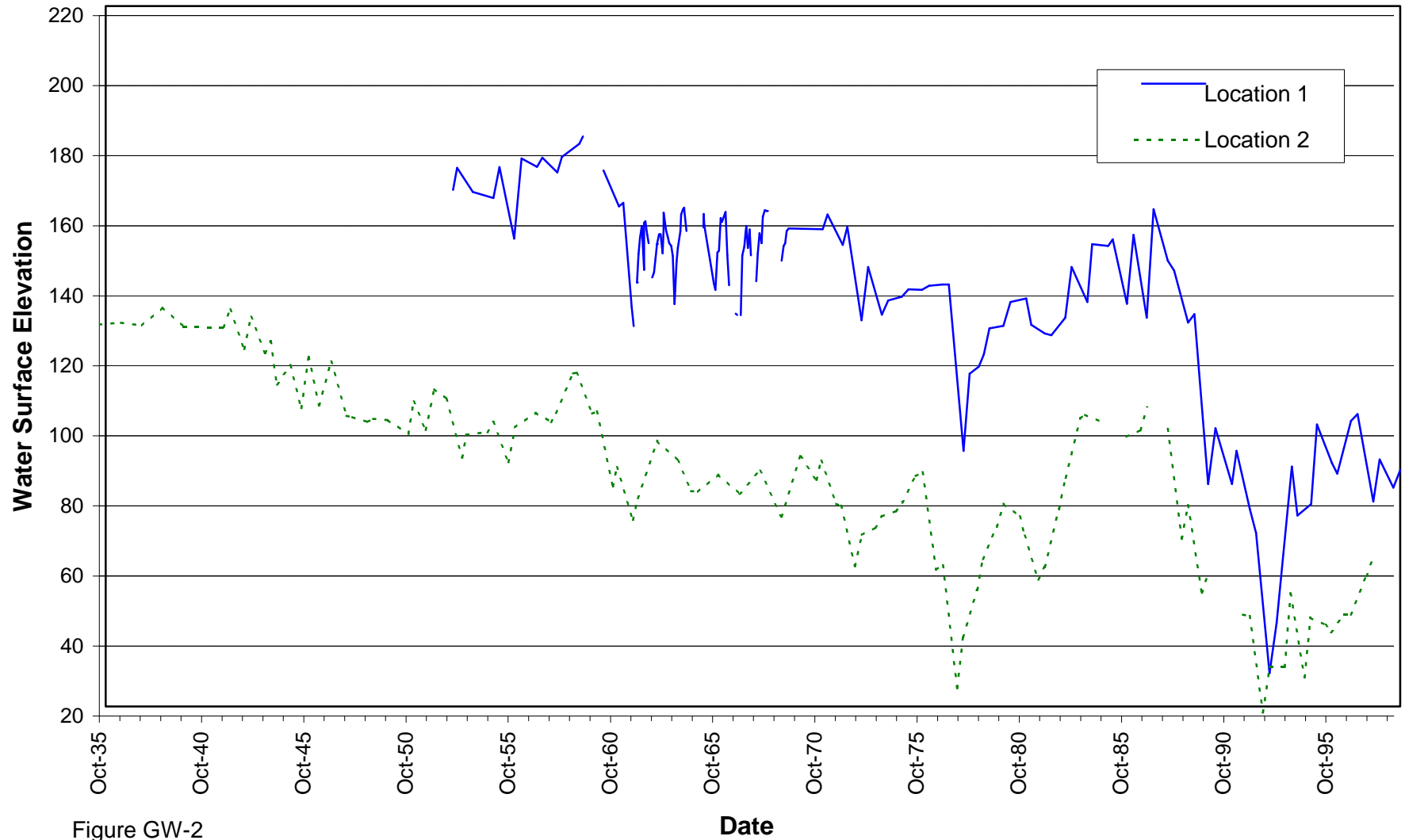
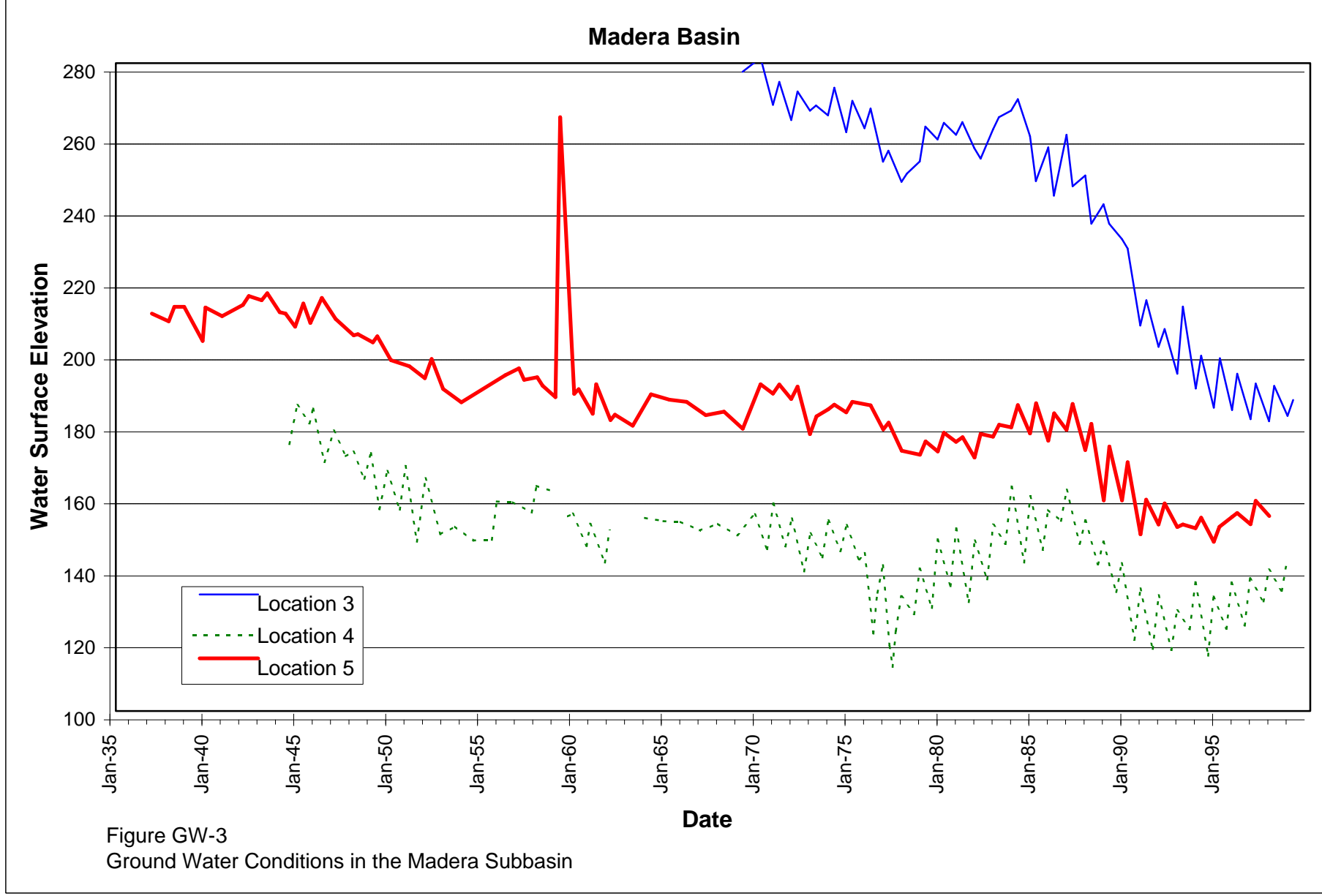


Figure GW-2
Ground Water Conditions in the Chowchilla Subbasin



Kings Basin

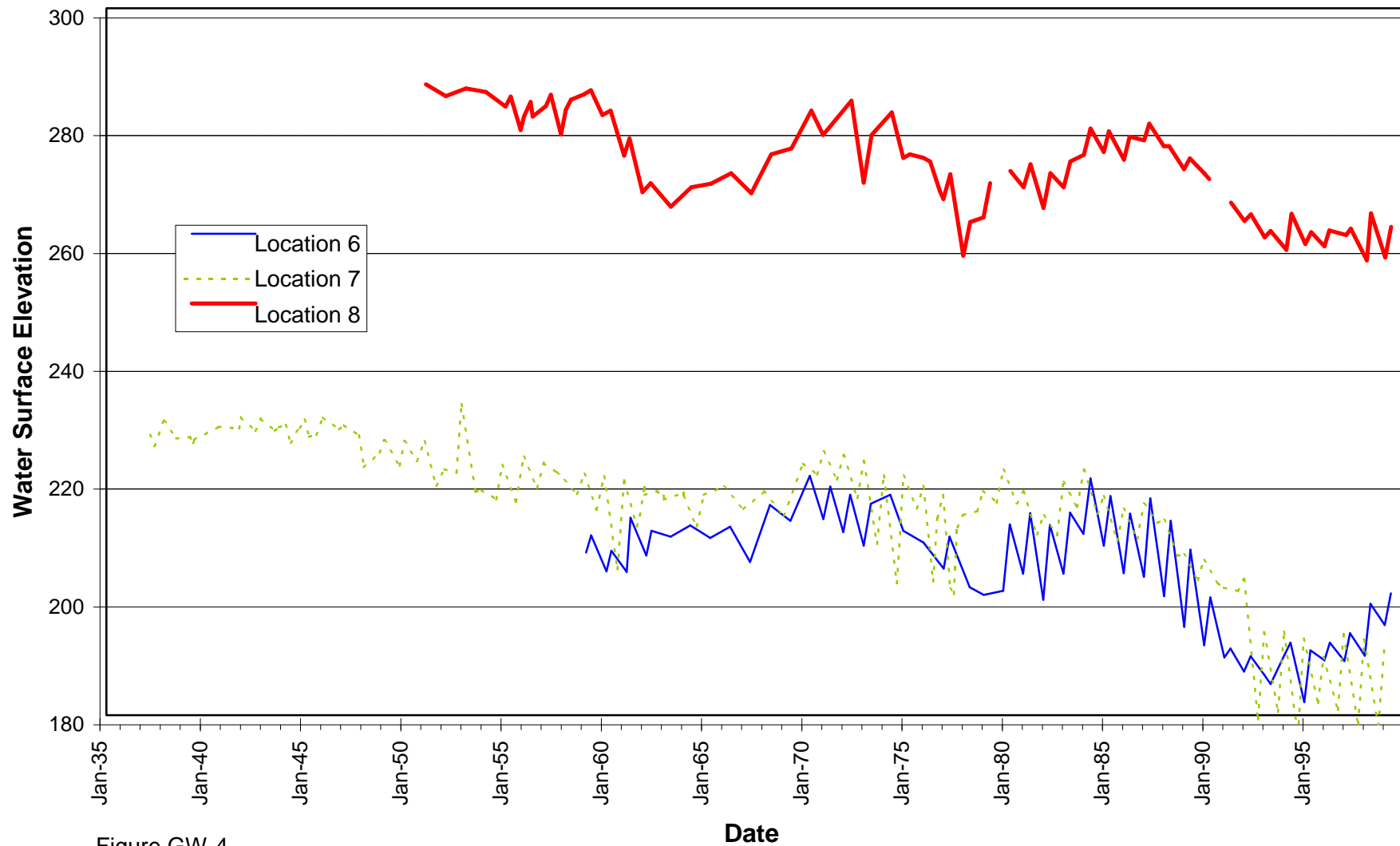


Figure GW-4
Ground Water Conditions in the Kings Subbasin

Kaweah Basin

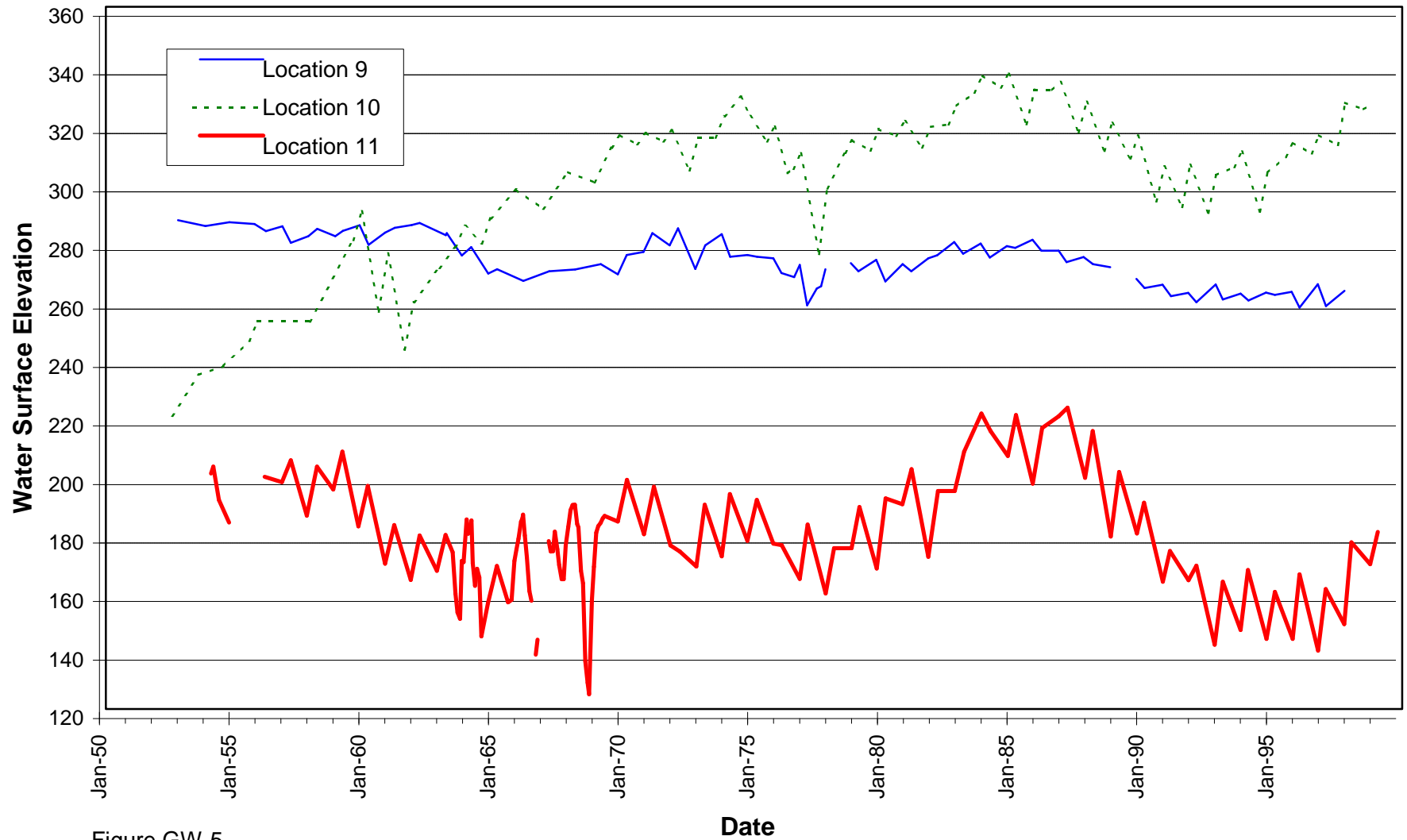
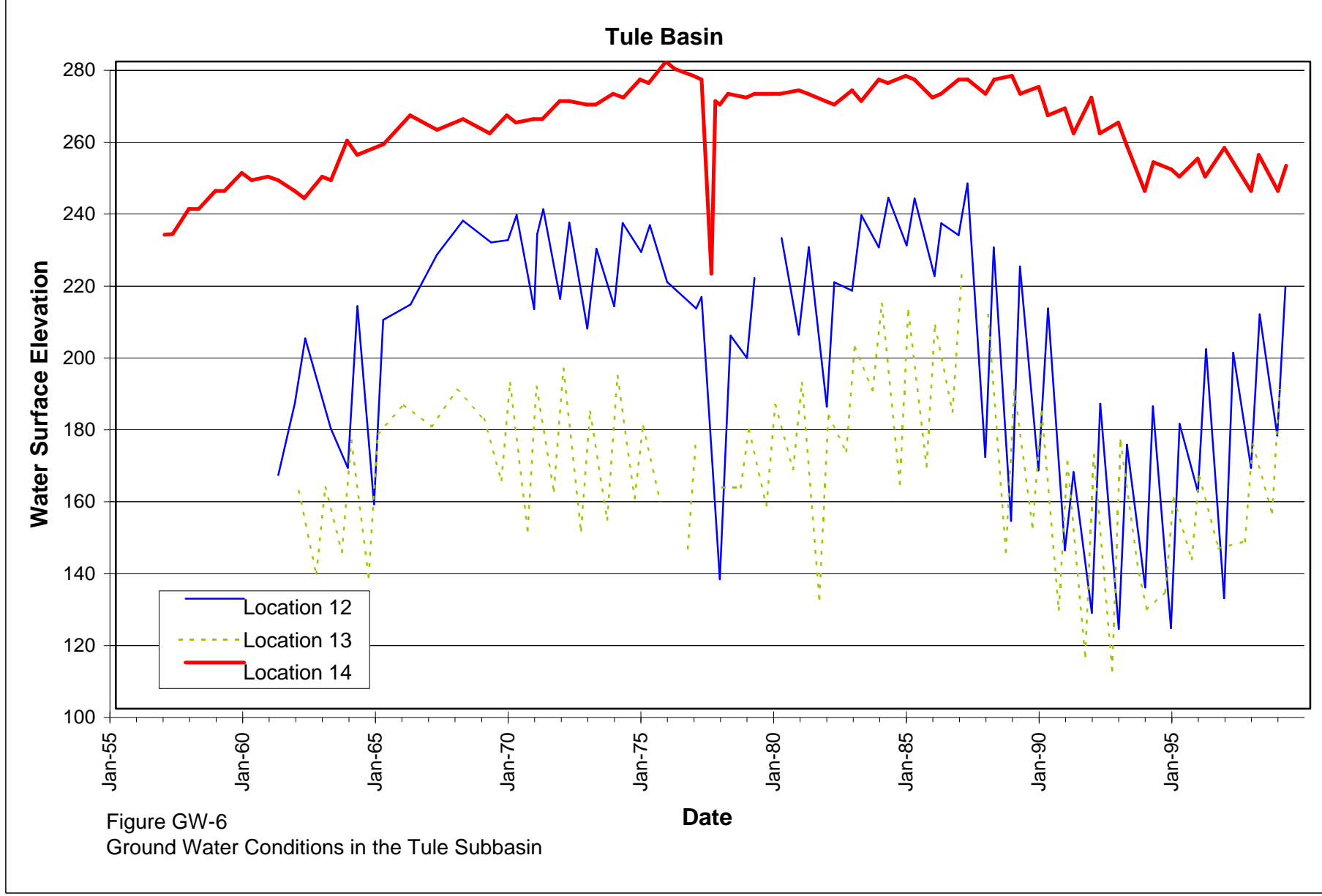


Figure GW-5
Ground Water Conditions in the Kaweah Subbasin



Kern Basin

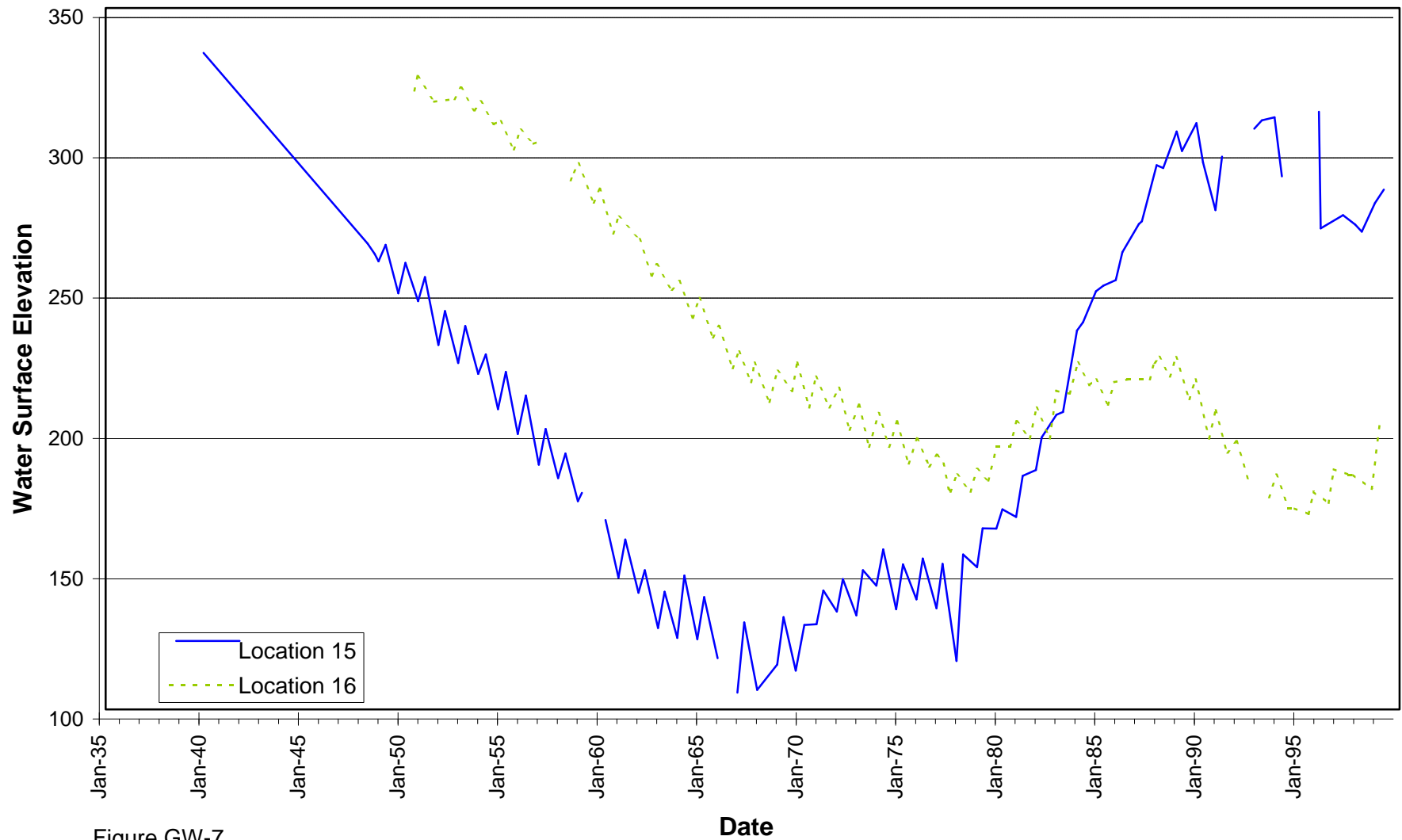


Figure GW-7
Ground Water Conditions in the Kern Subbasin

No Action Alternative

The available surface water supply for the Cross Valley Contractor service area and the required supplemental ground water needed under the NAA is described in the PEIS. For most years, ground water use will increase over historic conditions because of the reduced supply available from the Delta. Potential adverse effects associated with increased ground water usage include changes to the chemical composition of agricultural runoff, decreases in soil quality due to salt accumulation, diminution of ground water elevations, soil subsidence, and ground water quality. These conditions are described in the PEIS for the Preferred Alternative.

It is assumed that the Contractors will return to greater use of CVP water in years when water is available from the Delta. This should allow the ground water table to recharge and reduce the effects described above.

Alternative 1

Alternative 1 is similar to the NAA except for contracted differences and will have similar environmental effects as the NAA. Therefore, there are no environmental impacts from this alternative on the ground water resources of the region.

Alternative 2

Under Alternative 2, potential environmental consequences associated with ground water resources would most likely occur during years of decreased CVP water availability. The use of surface water and ground water in the Cross Valley service area was simulated in CVPM for various combinations of water year types (Table GW-2).

Table GW-2

Change in Ground Water Use in the CVPM Subbasins (Change from NAA in thousands of acre-feet/year)

Change in Water Use for an Average Year that Follows a 5-Year Period that is:

CVPM Subbasins	Average	Wet	Dry
17	-3.8	-3.8	-3.9
18	0.0	0.0	-0.1
20	-0.1	-0.1	0.0

Change in Water Use for an Wet Year that Follows a 5-Year Period that is:

CVPM Subbasins	Average	Wet	Dry
17	-7.4	-7.2	-7.4
18	-4.0	-4.0	-3.8
20	0.0	0.0	0.0

Change in Water Use for an Dry Year that Follows a 5-Year Period that is:

CVPM Subbasins	Average	Wet	Dry
17	0.0	0.0	0.0
18	0.0	0.0	0.0
20	0.0	0.0	0.0

Note: A positive number represents an increase in the use of water and a negative number represents a decrease in water use from the NAA.

Analyses of the economic and water use changes associated with Alternative 1 relative to the NAA show that within the Cross Valley Contractor service area (primarily subbasins 17 and 18), water users will decrease ground water use for some year types. The maximum shift is 7,400 af in subbasin 17. Under most of the scenarios evaluated, the regional ground water use will result in the same impacts as the NAA.

Under Alternative 2, a single year of decreased ground water pumping will not adversely or beneficially affect the ground water basin. Over the long term, the ground water use in subbasin 17 would decrease, based on the CVPM simulations.

Cumulative Effects

A number of ongoing and planned activities related to surface water in the San Joaquin Valley may place additional demands on CVP water resources. Specifically, plans to restore riparian habitat, anadromous fish habitat (the Anadromous Fish Restoration Program or AFRP) would require additional water supplies. These demands will likely place additional pressure on the surface and ground water resources of the region. Implementation of Alternative 1 or 2 will not influence the cumulative effects those other actions.

The recent deregulation of the power industry in California may lead to increased costs for electricity. This in turn would affect the contractors who use electric pumps to extract ground water. It is unknown whether changing power costs would result in a change in the ground water use in the region.

WATER QUALITY

Affected Environment

The following describes the affected environment for water quality within the Cross Valley Contractor service area and associated waterways. The affected water quality in the Tulare Lake Basin considers surface water quality and ground water quality.

Surface Water Quality

Surface water quality in the San Joaquin River Basin is affected by several factors, including natural runoff, agricultural return flows, biostimulation, construction, logging, grazing, operations of flow regulating facilities, urbanization, and recreation. The upper reaches of the rivers draining to the San Joaquin River Basin originate in large drainage areas high on the west side of the Sierra Nevada. The water in these rivers is generally soft with low mineral concentrations. As these streams flow from the Sierra Nevada foothills across the eastern valley floor, their mineral concentration steadily increases. This increase in concentration is fairly uniform for each of the east side streams.

Above Millerton Lake and downstream towards Mendota Pool, water quality is generally excellent. The reach from Gravelly Ford to Mendota Pool (about 17 miles) is frequently dry except during flood control releases because all water released from Millerton Lake is diverted upstream to satisfy water rights agreements, or percolates to ground water.

Wildlife refuges and duck clubs also contribute water of degraded quality to the San Joaquin River. The refuges begin flooding operations in the fall to maintain habitat for migratory waterfowl, primarily with water delivered from the Delta via the Delta-Mendota Canal. The salinity of the water in the ponds may increase during the fall due to evaporation and following winter seasons with low precipitation, often contributing poor quality water to the San Joaquin River when the ponds are drained in the spring.

Ground Water Quality

Ground water quality conditions in the San Joaquin River Region and the Tulare Lake Region vary throughout the area. Typical constituents are described below.

Total Dissolved Solids (TDS). TDS concentrations vary considerably in the San Joaquin River Region, depending upon the ground water zone. Characteristics of TDS in the Tulare Lake Region are similar to those occurring in the San Joaquin River Region. This distribution reflects the low concentrations of dissolved solids in recharge water that originates in the Sierra Nevada, and the predominant regional ground water flow pattern. In the center and on the east side, TDS concentrations generally do not exceed 500 mg/l.

Boron. In the southern portion of the Tulare Lake Region, high concentrations of boron are generally found in areas southwest to Bakersfield (greater than 3 mg/l) and southeast of Bakersfield (1 to 4 mg/l). Ground water in the Cross Valley area is not identified as a concern for elevated concentrations of boron.

Nitrates-Nitrate (NO₃-N). Several small areas of the Tulare Lake Region contain NO₃-N concentrations in excess of 10 mg/l. These include areas south and north of Bakersfield, around the Fresno metropolitan area, and scattered areas of the Sierra Nevada foothills in the Hanford-Visalia area. Municipal use of ground water as a drinking water supply is also impaired due to elevated nitrate concentrations in the Madera area and throughout the Tulare Lake Region.

Arsenic. In the Tulare Lake Region agricultural use of ground water is impaired due to elevated arsenic concentrations in the Tulare Lake Region, particularly in areas of the Kern basin near Bakersfield. Groundwater in the Cross Valley area is not identified as a concern for elevated concentrations of arsenic.

Dibromochloropropane (DBCP). DBCP has been detected in many ground water wells in the San Joaquin River Region and the Tulare Lake Region. Municipal use of ground water as drinking water supply is impaired due to elevated DBCP concentrations near several cities including Chowchilla, Madera, Merced, Visalia, Bakersfield, Fresno area, and scattered locations in southwest Tulare County.

Environmental Consequences

Water quality in the Cross Valley Contractor service area could be adversely affected during protracted dry conditions. During these times it is expected that many Contractors may increase their pumping and use of ground water.

No Action Alternative

Water quality in the rivers and ground water of the Cross Valley Contractor service area under the NAA is not anticipated to change significantly from past conditions. Factors that tend to influence water quality, such as agricultural runoff, will continue similar to historic conditions. However, as shown in the PEIS, the average delivery south-of-the-Delta is projected to decline from historic conditions. This may increase reliance on ground water to meet irrigation demands. Depending on the quality of the ground water used, the shift to ground water may result in application of water of a lesser quality than surface water. Continued application of this water under the NAA may influence water quality over the long term.

Alternative 1

Alternative 1 is similar to the NAA except for administrative differences and will have similar effects to ground water as the NAA. Therefore, there are no environmental impacts of this alternative.

Alternative 2

The Ground Water Section of this report described the potential impact associated with decreases in ground water pumping in subbasins 17, 18, and 20. This decrease in pumping should have a small, but unquantifiable, benefit to water quality as farmers switch to better-quality surface water.

Cumulative Effects

The water demands associated with the foreseeable projects will increase the demand for the limited water resources of the area. This may increase the use of poorer quality ground water on irrigated lands. However, projects that supply additional water to the San Joaquin River as part of restoration efforts will tend to improve water quality. Implementation of this project will not influence the cumulative effects of foreseeable projects on water quality.

FISHERIES RESOURCES**Affected Environment**

The fisheries resources affected by the Cross Valley Contractors include the canal and the San Joaquin River. The fish found in CVP waters include both native and introduced fish species based on records of the Department of Fish and Game and other sources (Table FR-1). The status of fish species in terms of the Federal Endangered Species Act (ESA) and special status for the State of California also is identified in Table FR-1. Chinook salmon and steelhead trout that migrate through the San Joaquin River to and from its tributaries are both listed under the ESA.

Table FR-1
Fish Species of Waters Associates with the Cross Valley Canal

Species	San Joaquin River (below Friant Dam)
Lamprey <i>Lampetra</i> spp.	N
White sturgeon <i>Acipenser transmontanus</i>	N
American shad <i>Alosa sapidissima</i>	I
Threadfin shad <i>Dorosoma petenense</i>	I
Chinook salmon <i>Oncorhynchus tshawytscha</i>	N, FPT
Steelhead <i>Oncorhynchus mykiss</i>	N, FT
Rainbow trout <i>Oncorhynchus mykiss</i>	N
Kokanee <i>Oncorhynchus nerka</i>	
Brook trout <i>Salvelinus fontinalis</i>	I
Brown trout <i>Salmo trutta</i>	I
Carp <i>Cyprinus carpio</i>	I
Goldfish <i>Carassius auratus</i>	I
Golden shiner <i>Notemigonus crysoleucas</i>	I
Blackfish <i>Orthodon microlepidotus</i>	N
Hardhead <i>Mylopharodon conocephalus</i>	N, SC
Hitch <i>Lavinia exilicauda</i>	N
Sacramento pikeminnow <i>Ptychocheilus grandis</i>	N
Sacramento sucker <i>Catostomus occidentalis</i>	N
Channel catfish <i>Ictalurus punctatus</i>	I
White catfish <i>Ictalurus catus</i>	I
Brown bullhead <i>Ictalurus nebulosus</i>	I
Mosquitofish <i>Gambusia affinis</i>	I
Mississippi siverside <i>Menidia audens</i>	
Three spine Stickleback <i>Gasterosteus aculeatus</i>	N
Striped bass <i>Morone saxatilis</i>	
Black crappie <i>Pomoxis nigromaculatus</i>	I
White crappie <i>Pomoxis annularis</i>	I
Warmouth <i>Lepomis gulosus</i>	I
Green sunfish <i>Lepomis cyanellus</i>	I
Bluegill <i>Lepomis macrochirus</i>	I
Redear sunfish <i>Lepomis microlophus</i>	I
Largemouth bass <i>Micropterus salmoides</i>	I
Spotted bass <i>Micropterus punctulatus</i>	
Smallmouth bass <i>Micropterus dolomieu</i>	I

Table FR-1
Fish Species of Waters Associates with the Cross Valley Canal

Species		San Joaquin River (below Friant Dam)	
Sculpin	<i>Cottus spp.</i>	N	
Note:			
N	Native	SC	State listed as Special Concern
I	Introduced	FE	Federally listed Endangered
SE	State listed as Endangered	FT	Federally listed Threatened
ST	State listed as Threatened	FPE	Federally Proposed Endangered
SCE	State Candidate Endangered	FPT	Federally Proposed Threatened
SCT	State Candidate Threatened		

Anadromous Fish Restoration Program (AFRP)

CVPIA Section 3406(b)(1) states, “The Secretary...is authorized and directed to...develop within three years of enactment and implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967- 1991...” The section also states, “this goal shall not apply to the San Joaquin River between Friant Dam and the Mendota Pool.”

The Service and Reclamation approached implementing the directive to “at least double natural production of anadromous fish” by developing the AFRP. The AFRP is the cornerstone of many actions aimed at restoring natural production of anadromous fish in the Central Valley and includes partnerships, local involvement, public support, adaptive management, and flexibility.

To plan and implement a comprehensive program, the AFRP requires ongoing, intensive public involvement at two levels. The first level is programmatic, involving efforts to plan a comprehensive program. The second level is action-specific and involved implementing specific actions in individual watersheds. At the action-specific level, the AFRP worked with local agencies and local watershed workgroups.

After public review and revision, the Department of the Interior released a Revised Draft Restoration Plan for the AFRP in June 1997. The Restoration Plan presented the overall goal, objectives, and strategies of the AFRP and described how the AFRP identified and prioritized nearly 300 restoration actions and evaluations. The Restoration Plan is a programmatic-level description of the AFRP, and is used to guide implementation of all CVPIA sections. In the future, a detailed implementation plan will be completed. This plan will be an evolving document, amended over time as additional information is gathered, partnerships are formed, and actions are implemented. Water for this activity will come from willing sellers. No new water will be allocated from the CVP.

Fish Species or Communities Included

Fish in the canal may include the non-anadromous fish species found in the mainstream of the San Joaquin River downstream of Friant Dam. The fish found in the mainstream of the San Joaquin River downstream of Friant Dam include native and introduced non- anadromous fish as well as anadromous fish. As identified above, two of the anadromous salmonid species that migrate through the San Joaquin River are listed under the ESA.

In order to characterize the life histories and habitat use of the fish found in the Cross Valley Canal Unit waters, we have selected target species to represent the fish community. The target species for the San Joaquin River include ESA-listed salmonids, recreational species, and native minnows. Below Friant Dam, Chinook salmon, steelhead trout, Sacramento pikeminnow, and largemouth bass were selected to represent the requirements of fishes in the mainstream San Joaquin River.

Life History of San Joaquin River Fishes Below Friant Dam

Life History of Chinook Salmon

Adult Chinook salmon migrate up the San Joaquin River from the Delta to gain access to spawning and rearing areas in the Stanislaus, Tuolumne and Merced Rivers. These rivers provide the cold, freshwater sites with suitable gravel required for successful reproduction. Female Chinook salmon deposit their eggs in redds, or nests, which they excavate in gravel areas of relatively swift water. The eggs are fertilized by one or more males. Fecundity varies among different populations and with body size. All adult Chinook salmon die after spawning. Females generally prefer gravel ranging from 1 to 6 inches in diameter, depths exceeding 0.5 foot, and water velocities ranging from 1.5 to 2.5 feet per second (Vogel and Marine 1991). There is currently no spawning in the San Joaquin River by Chinook Salmon.

Incubation time is inversely related to water temperature. Eggs generally hatch in approximately six to nine weeks, and newly emerged fry remain in the gravel for another two to four weeks until the yolk is absorbed. Maximum survival of incubating eggs and larvae occurs at water temperatures between 41 and 56 degrees Fahrenheit. Incubation occurs only in the tributaries.

After emerging, Chinook salmon fry begin to feed and grow in the stream environment. Chinook salmon fry tend to seek shallow, near shore habitat with low water velocities and move to progressively deeper, faster water as they grow. In streams, Chinook salmon fry feed mainly on drifting terrestrial and aquatic insects, but zooplankton become more important in the lower river reaches and estuaries. Juveniles typically rear in freshwater for two to three months before migrating to sea. The San Joaquin River is used as a migration corridor for downstream moving fry and smolts and may be used for rearing as well.

Chinook salmon in the Central Valley appear to exhibit stream-type (spring run) and ocean-type (fall-run) behavior (Healy 1991). An ocean-type life history pattern is characterized as having juveniles that migrate seaward as smolts in their first year of life and an adult stage that spawns shortly after entering freshwater. Juvenile Chinook salmon typically spend two to three months in freshwater before emigrating as smolts; this is the dominant pattern. Stream-type behavior is indicative of Chinook salmon that remain in freshwater for at least one year prior to emigrating as smolts and an adult stage that has a substantial residency time prior to becoming sexually ripe and spawning. Fall run Chinook is the only run of salmon remaining in the San Joaquin Basin.

During the smolting process, juvenile Chinook salmon undergo physiological, morphological, and behavioral changes that stimulate emigration and prepare them for ocean life. Chinook salmon spend two to four years maturing in the ocean before returning to their natal streams to spawn. Most Chinook salmon mature at two (primarily males) and three years of age, while a smaller proportion matures at four.

Fall-Run Chinook Salmon

Adult fall-run Chinook salmon migrate through the Sacramento-San Joaquin River Delta and into Central Valley rivers from July through December and spawn from October through December. Peak spawning usually takes place in October and November. Egg incubation begins in October and can extend into March, but in some years could occur as late as mid-May.

Chinook salmon fry (juveniles less than 2 inches long) generally emerge from December through March, with peak emergence by the end of January. Generally, fry emigrate from December through March and smolt from April through June, and a small proportion of the population emigrates as yearlings from October through December.

Two principal movements of juvenile fall-run Chinook salmon out of the tributaries have been identified. Fry begin leaving the tributaries in January, with peak abundance occurring in February and March. In general, fry movement increases in concert with high winter flows. A later emigration of smolts takes place from April through June. It is unknown if fry rear in the estuary and emigrate as smolts during the normal smolt emigration period. Smolts arriving in the estuary from upstream rearing areas migrate quickly through the Delta and Suisun and San Pablo bays.

Factors Affecting Abundance

The following discussion highlights those factors that have been specifically identified as having important effects on Chinook salmon abundance in the San Joaquin River Basin and that can be altered by changes in project operations. Only life history stages using the mainstream San Joaquin River would be affected including adult upstream migration, rearing and juvenile migration.

Upstream Migration

Flow. Flows in the San Joaquin River have been inadequate during fall, resulting in delaying the upstream migration past Stockton or the straying of adult salmon into agricultural drainage ditches, primarily Mud and Salt sloughs. Barriers (electrical and physical) were installed across the San Joaquin River upstream of the Merced River confluence in 1992 to prevent salmon migration into these sloughs and help guide them into the Merced River.

Water Temperature. Chinook salmon migrated into the lower San Joaquin River as water temperatures declined from 72 to 66 degrees Fahrenheit (Hallock 1970).

Water Quality. Low dissolved oxygen levels (less than 5 parts per million) and high water temperatures (greater than 66 degrees Fahrenheit) in the San Joaquin River near Stockton delayed or blocked the migration of adult Chinook salmon during the 1960s (Hallock et al. 1970). Since 1964, fall migration problems have been reduced by improved wastewater treatment and installation of a physical barrier at the head of Old River in dry years to direct most of the San Joaquin flows down the main channel past

Stockton. Despite these efforts, low dissolved oxygen levels recurred during recent drought conditions. Proposed remedial measures include increasing tributary outflow, evaluating and monitoring dredging activity in the Delta, and further evaluating the fall barrier at Old River (San Joaquin River Management Council 1992).

Juvenile Rearing

Flow. Streamflow has been identified as the primary factor affecting abundance of Chinook salmon stocks in the San Joaquin River Basin. Streamflow reductions after April and May in the Merced and Tuolumne rivers result in poor survival conditions for Chinook salmon juveniles that remain in these tributaries beyond these months. High mortality generally results from reduced living space, high water temperatures, and increased predation. Current interim instream flow requirements in the Stanislaus River provide adequate flow conditions through the Chinook salmon rearing period.

Water Temperature. Generally, water temperatures below major dams on the San Joaquin River tributaries become unsuitable for Chinook salmon rearing in May or June, causing high mortality of juvenile Chinook salmon that have not yet emigrated. In the Stanislaus River, however, releases of cold hypolimnetic water from New Melones Reservoir have improved water temperatures during the late spring rearing period relative to pre-impoundment conditions (Reclamation 1986).

Water Quality. Selenium in agricultural drainage water poses a potential risk to juvenile Chinook salmon in the San Joaquin River. Selenium is directly toxic to fish at elevated levels in the water column and through bioaccumulation in body tissues. Growth and survival of juvenile Chinook salmon are adversely affected by exposure to dissolved and dietary selenium, but harmful levels have not been detected in the major rearing areas of the San Joaquin River (DFG 1987b).

Juvenile Emigration

Flow. Spring flows in the San Joaquin River and major tributaries during the Chinook salmon emigration period appear to have a major influence on the number of adults returning to the San Joaquin River Basin. Positive correlations exist between spring flows in the San Joaquin River and total Chinook salmon spawning escapement 2.5 years later. Greater inflow has been required to maintain Chinook salmon escapement after the operation of the SWP. Similar relationships for San Joaquin River tributary stocks indicate that the flow required to maintain a given spawning escapement level increased following operation of the CVP and SWP. Over time, increases in the significance of other mortality factors, such as increased Delta exports, have diminished the positive effects of incremental increases in spring flows (DFG 1987b).

Smolts migrating down the San Joaquin River and through the southern Delta frequently encounter low flows, high temperatures, and high diversion rates. Currently proposed spring outflow recommendations for the Merced, Tuolumne, and Stanislaus rivers are designed to improve survival of juvenile salmon migrating down the tributaries, the mainstream San Joaquin River, and through the Delta. Recent evaluations have focused on the effectiveness of releasing short-duration, high-amplitude flows (i.e., pulsed flows) from tributary streams in conjunction with reduced Delta exports.

Water Temperature. Declining streamflow during the spring emigration period of fall-run Chinook salmon coincides with rising air temperatures and increased agricultural return flows to the San Joaquin River, often resulting in deleterious water temperatures along much of the emigration route in the lower

San Joaquin River. In May, water temperatures in the San Joaquin River near Vernalis often reach high chronic stress levels (greater than 67.6 degrees Fahrenheit) at flows of 5,000 cfs or less. Under these conditions, up to half the production of San Joaquin River Chinook salmon can be subjected to harmful water temperatures (DFG 1987)

Life History of Steelhead Trout

Life history aspects of the few steelhead in the San Joaquin River system are likely similar to those described below for the Sacramento River system. Although remaining steelhead use the mainstream San Joaquin River as a migration corridor there is very little known about present steelhead use of the San Joaquin River. Upstream spawning migration runs in the Mokelumne River extend from September through January (DFG 1991).

Steelhead are generally classified into two races, depending on whether they begin their upstream migration in winter or summer. Historically, only winter steelhead trout were native to the Sacramento River Basin. However, summer steelhead have been introduced into the basin, along with strains of winter steelhead from the Eel, the Mad, the Rogue (Oregon) and the Washougal (Washington) river basins. Because of these introduced individuals, the genetic composition of the native steelhead trout could have been modified.

It is possible that adult steelhead can be found in freshwater during every month of the year due to the influence of introduced genetic strains, modified and unnatural flow and/or temperature regimes throughout the basin.

Upstream Migration.

Upstream migration occurs generally from July through February, depending on prevailing flow and temperature conditions. On the Sacramento River tributaries, relatively early attraction of steelhead trout can be triggered by occasional reservoir releases of cold water and natural high-water conditions. The upstream migration run can consist of both sexually mature adults and immature individuals who have spent only a few months at sea.

The smaller steelhead, sometimes called fall steelhead, begin entering the river in July, peak in November, spawn primarily in late December and January, and complete spawning by mid-February. The larger winter steelhead migrate upstream during mid-December through February, spawn in late January through early March, and complete spawning by April 1. Steelhead stocks in the Sacramento River appear to respond to environmental conditions to a greater degree than do pure native stocks.

While adult steelhead are in freshwater, they rarely eat and consequently grow very little (Pauley et al. 1986).

Spawning

There has not been any recent documented steelhead spawning in the mainstream of the San Joaquin River.

Juvenile Rearing

Unlike Chinook salmon, steelhead rear year round in the tributary streams. There is no steelhead rearing in the mainstream San Joaquin River.

Juvenile Emigration

With most stocks of steelhead, juveniles emigrate downstream to the ocean in November through May (Schaffter 1980); however, most Sacramento River steelhead migrate in spring and early summer (Flosi et. al. 1998). Sacramento River steelhead generally migrate as one-year-olds at a length of 6 to 8 inches (Barnhart 1986; Reynolds 1993). Emigration rates are influenced by water temperatures and current velocities. Although some steelhead have been collected in most months at the state and federal pumping plants in the Delta, the peak numbers salvaged at these facilities have been primarily in March and April in most years.

Factors affecting steelhead trout abundance in the San Joaquin River Basin are similar to those described in detail for San Joaquin River fall-run Chinook salmon. The primary factors limiting abundance and distribution are dams, water diversions, poor water quality, and riparian impacts. Low summer flows and concurrent high water temperatures preclude the necessary year-round rearing habitat for steelhead trout below the impassable dams (Friant, Crocker Huffman, LaGrange, Goodwin, and Camanche) on the mainstream San Joaquin River and its major tributaries.

Life History of Sacramento Pikeminnow

The Sacramento pikeminnow (formerly Sacramento squawfish) is common in the larger intermittent and permanent streams of the Sierra Nevada foothills and valley floor. While pikeminnow do best in undisturbed streams, they are still found in the San Joaquin River below Friant Dam. Pikeminnow spend much of their time in deep, well-shaded pools of clear streams. They do not do well in disturbed environments inhabited by abundant introduced species.

Pikeminnow are predatory fishes, and prior to the introduction of other large piscivorous species, were undoubtedly at the top of the aquatic food chain in the Central Valley and surrounding foothills. Pikeminnow feed throughout the water column on a variety of prey. Prey item selection is dependent on availability, season and other species present. Pikeminnow will exploit potential prey not being utilized by other competing species. Typically, pikeminnow less than 7 inches will feed on aquatic insects, while pikeminnow greater than 7 inches will feed on other smaller fish.

Adult pikeminnow are rather sedentary in habit; they are found in the same habitat for much of their life. There they spend much of their time under submerged rocks or logs, where they ambush their prey. At dusk they will come out and actively forage for food. Juveniles swim about in schools in shallow water of large stream pools or reservoirs.

Growth in Sacramento pikeminnow varies by season and habitat. Pikeminnow grow fastest from the time they hatched from their eggs in May until the stream flows recede in July. Some growth takes place again during the winter months when stream flows increase, though colder temperatures probably keep the fish from growing as fast as they do in the early summer months. Fish in larger permanent streams also grow faster than in small intermittent streams.

Sacramento pikeminnow are sexually mature by the third or fourth summer at approximately 8 inches. Ripe fish migrate upstream in April and May to spawn in gravel riffles when temperatures exceed 57 degrees Fahrenheit. In reservoirs they may spawn in gravel areas close to shore.

Spawning

Spawning behavior is probably similar to that of the northern pikeminnow. During spawning, large numbers of pikeminnow congregate over a gravel substrate where a single female may be pursued by up to six males. Spawning takes place when the female dips close to the bottom and releases a small number of eggs, which are simultaneously fertilized by one or more males that are in her company. The fertilized eggs continue to sink where they adhere to the bottom.

Egg Incubation and Emergence

In northern pikeminnow, the eggs hatch in four to seven days at 64 degrees Fahrenheit. In another seven days the fry then begin schooling in the shallows.

Factors Affecting Abundance

Introduced Species

Introduced species are perhaps the greatest threat to native cyprinids in the Central Valley. Predation from large piscivorous fishes, such as largemouth bass have reduced the abundance (or extirpated) of many native cyprinid species.

Flow

Receding water levels can expose eggs to desiccation. Reduced flows may also limit the available habitat. Deep pools may become too shallow and no longer suitable to pikeminnow.

Temperature

Temperatures outside the preferred life history ranges will have an adverse affect on the pikeminnow population. Unseasonal temperatures below the preferred range may stunt growth or delay spawning or hatching.

Life History of Largemouth Bass

Largemouth bass were first introduced into California in 1874 and have since spread to most suitable waters. They are abundant in reservoirs and river backwaters throughout the Central Valley and are normally found in warm, quiet waters with low turbidity and beds of aquatic plants. Largemouth bass provide an important sport fishery component of the Central Valley reservoirs and are one of the most sought after warm-water game fish in California. Largemouth bass are extremely vulnerable to angling, and at least half the population of legal-size fish is caught annually in many reservoir. Overtime, the catch

rate declines and the fish caught are smaller on the average. Reservoir aging reduces cover and forage fish, which reduces largemouth bass populations.

Largemouth bass spawn for the first time during their second or third spring. Spawning activity usually begins in April, when water temperature reaches 61 degrees Fahrenheit, but could continue through June. Males build nests in sand, gravel, or debris-littered bottoms at a depth of 3 to 6 feet. Receding water levels can strand nests and expose them to desiccation. The eggs adhere to the substrate and hatch in two to five days. The sac fry usually spend five to eight days in or around the nest.

For the first month or two, fry remain in the shallows and feed mainly on rotifers and small crustaceans. By the time they are 2 to 3 inches long, they feed primarily on aquatic insects and fish fry. After reaching a length of 4 inches, largemouth bass feed primarily on fish and large aquatic invertebrates. Juvenile bass smaller than 4 inches rely on cover in shallow water to escape predation. Optimal temperatures for growth are 68 to 86°F. Bass may grow to 15-inches by the fourth or fifth year.

Food availability for largemouth bass may be affected by competition and by the amount of cover available to prey. Competition effects are likely to be most severe for young-of-the-year bass because they feed on zooplankton and other small invertebrates favored by many other fishes. In reservoirs such as Millerton Lake, competition with threadfin shad can depress the growth and survival of young bass, by reducing invertebrate populations used as food.

Largemouth bass are extremely vulnerable to angling, and at least half the population of legal-size fish is caught annually in many reservoirs. Over time, the catch rate declines and the fish caught are smaller on the average. Competition between young bass and other plankton feeding fish, primarily threadfin shad, also reduces largemouth bass populations.

Factors Affecting Abundance

Flow

Receding water levels during incubation can expose some eggs to desiccation. Reduced flows may also limit the available habitat and cover.

Temperature

Temperatures outside the preferred life history ranges will have an adverse affect on the largemouth population. Unseasonal temperatures below the preferred range may stunt growth or delay spawning or hatching.

Environmental Consequences

Potential environmental consequences of the project included changes to surface water storage and flows because of changes to the amount of CVP water purchased. For fishery issues, these equate to changes in the amount of water moving through the Cross Valley Canal, changes in surface water storage in Millerton Lake or changes in streamflows in the San Joaquin River. These potential effects are discussed below.

The level of significance for fisheries impacts is defined as a change in surface storage, or river flow of a magnitude that would have a substantial adverse effect on fish habitat during a critical life history phase.

No Action Alternative

Water use is expected to continue as it has using both CVP surface water supplies and ground water. Ground water has typically been more important during dry years when CVP water is less available. The surface water resources of the Delta under the NAA are discussed in the Preferred Alternative of the PEIS.

Alternative 1

Alternative 1 is similar to the NAA. Therefore, there are no impacts to fishery resources under this alternative.

Alternative 2

The analysis of the blended water pricing structure indicates that in some periods, contractors will purchase less CVP water and rely more on ground water (CH2M Hill 2000). The largest shift would occur in a wet year following five dry years. According to the economic analysis, this situation would result in a reduction of surface water use of approximately 113,100 acre-feet for one subunit from Millerton Lake. This water would remain in Millerton Lake until purchased by other Cross Valley users.

Water not purchased would most likely be picked up by other users. The timing for distribution of this water is speculative and depends on many factors. It could result in different timing in the movement of water in the Cross Valley Canal.

Cumulative Impacts

Alternatives 1 and 3 have little or no change in surface water associated with them and therefore, they essentially do not contribute to the cumulative effect.

Restoration actions in the Delta may improve conditions for fish. Therefore water resources of the Delta are discussed in the PEIS.

LAND USE RESOURCES

Affected Environment

The service areas of the eight Cross Valley Contractors are located along the eastern edge of the southern San Joaquin Valley, stretching from Fresno County on the north to Bakersfield on the south (Figure PN-1). Contracted CVP water deliveries of 128,300 af (see Section 1, Table PN-1) are conveyed via the Friant-Kern Canal to over 190,000 acres of irrigated farmland within the service areas of the eight Cross Valley Contractors and their subcontractors (Table LU-1). Water deliveries are used primarily for irrigation, but a small amount of water is used for M&I purposes.

Agricultural Land Use

In addition to the eight Cross Valley Contractors receiving irrigation deliveries under Cross Valley Canal Exchange Contracts, Atwell Island Water District and Alpaugh Irrigation District receive irrigation deliveries under subcontracts with the County of Tulare. In terms of irrigated acreage, the districts range in size from approximately 1,800 to 90,000 acres, with almost 800 farming entities averaging 246 acres each (Table LU-1). The actual number of landowners is much higher than the number of farming entities because many farming entities farm leased lands in addition to owned land.

Table LU-1
Listing of Irrigated Acreage and Farm Size for the Cross Valley Contractors

Contractor	Approx. No. of Farming Entities	Irrigated Acreage(acres)	Average Operating Farm Size(acres)
County of Tulare (subcontractors)			
Alpaugh Irrigation District	190	6,104	32
Atwell Island Water District	58	4,327	75
Hills Valley Irrigation District	25	2,304	92
Kern-Tulare Water District	31	20,202	652
Lower Tule River Irrigation District	259	89,772	347
Pixley Irrigation District	118	62,239	527
Rag Gulch Water District	13	5,138	395
Tri-Valley Water District	87	1,804	21
Total	781	191,890	246

Source: Friant Water Users Authority 1998

The Friant Division delivers water to the Cross Valley Contractors in addition to the Friant Division contractors. The service area of these contracts cover a major portion of three counties (Fresno, Tulare,

and Kern, Madera), which alone account for \$10.36 billion in gross agricultural production, or nearly 40 % of California's total production (Table LU-2). The leading agricultural commodities in the counties served by the Cross Valley Contractors are grapes, milk, cotton, almonds, and citrus, which accounted for nearly \$4 billion in gross agricultural production in 1998. The leading crops in terms of acreage in the Cross Valley Contractors service areas are alfalfa, corn, cotton, wheat, orchards, and vineyards.

Table LU-2**Ranking of Cross Valley Contractor Counties by Total Value of Agricultural Production**

1998 CA Rank	County	1998 Production (\$1,000)	% of Total CA Value	Cumulative Percentage	Leading Crops
1	Fresno	3,286,806	12.2	12.2	Grapes, poultry, cotton, tomatoes, milk
2	Tulare	2,922,057	10.8	23.0	Milk, oranges, grapes, cattle & calves, alfalfa
4	Kern	2,067,678	7.7	30.7	Grapes, citrus, almonds, cotton, milk

Source: USDA 1999

In 1996, approximately 50 different crops, totaling over 182,000 acres, were produced within the Cross Valley Contractors service area. These various crops are summarized using the 22 categories developed by Reclamation as part of its Water Needs Analysis for LTCR negotiations with CVP contractors (Table LU-3). Each crop group name represents crops with similar seasonal crop water requirements. Crop acreages for 1996 are being used by Reclamation as representative of existing conditions in its Water Needs Analysis. Yearly total irrigated acreages vary depending on fallowing and double cropping.

Table LU-3**Cross Valley Contractors – 1996 Crop Acreages**

Reclamation Crop Group Name	Acres
Alfalfa	35,040
Almonds	4,455
Barley	1,660
Beans (dry)	502
Corn (field)	34,393
Cotton	32,182
Deciduous Orchard	5,177
Grains	5,621
Melons	516
Miscellaneous Truck/Field Crops (high)	158
Miscellaneous Truck/Field Crops (low)	828
Miscellaneous Truck/Field Crops (medium)	2,077
Pasture (improved)	2,696
Subtropical Orchard	15,453
Sugar Beets	931

Table LU-3
Cross Valley Contractors – 1996 Crop Acreages

Reclamation Crop Group Name	Acres
Vineyard	15,379
Wheat	25,120
Total	182,188

Source: Reclamation 1999

Note: ¹ The crop acreage numbers include 1995 data for Rancho Terra Bella. Tri-Valley Water District is exempt from reporting crop water needs. No 1996 data was available for County of Fresno and Tulare.

Water for these communities and other M&I users in the Cross Valley Contractor service area comes almost entirely from pumping of ground water. The quality of the ground water, for the most part, does not require treatment prior to use. There are no major population centers in the service area of the Cross Valley Contractors. The only significant use of Cross Valley Canal water for M&I purposes is by the Strathmore Public Utility District (PUD) and Fresno County. The PUD is under subcontract with Tulare County and supplies the only source of water for the City of Strathmore. Fresno County water is used for golf course and landscape irrigation at the Brighton Crest development near Millerton Lake.

Conversion of Agricultural Land to Alternative Uses

The conversion of agricultural land to alternate uses is not a significant issue for the Cross Valley Contractors because of the lack of major population centers in their service areas. However, it is a major issue for the San Joaquin Valley and its agricultural-based economy. The California Water Plan Update, Bulletin 160-98, predicts that over 130,000 acres of irrigated crop acreage will come out of production between 1995 and 2020. Although retirement or conversion of agricultural land on the west side of the valley from irrigated crop production to dryland farming or wildlife habitat will account for a significant portion of this acreage, conversion of agricultural lands to urban uses will account for much of the predicted 130,000 acre decrease. During the period 1992 to 1997, of the counties receiving Cross Valley Contractor irrigation water deliveries, only Fresno County showed increases in the amount of lands in farms and in the average size of farms (Table LU-4).

Table LU-4
Agricultural Land Trends 1992-1997

County	Land in Farms (acres)			Average Size of Farms (acres)		
	1992	1997	% Change	1992	1997	% Change
Fresno	1,774,664	1,881,418	12.2	253	285	+13
Tulare	1,354,262	1,309,525	-3	248	240	-3
Kern	NA	NA		NA	NA	

Source: USDA 1997

Note: NA Not Available

Historically, agricultural lands receiving CVP water that are converted to urban uses have not continued to use CVP water. The land use change generally results in a change in water supply, from agricultural to a urban community water system. Ground water is generally preferred for a community water system. The CVP water is generally reallocated to other agricultural lands in the district or used to recharge ground water.

Environmental Consequences

Growth-Inducement Impacts

Under NEPA, the potential for growth-inducing impacts as indirect effects of a project are to be considered. A project will not cause an indirect effect unless the effect would not occur “but for” the project. The growth-induced impact evaluation is based on whether implementation of Alternative 1 or 2 in the Cross Valley service area would result in increased growth, and the presumed growth and impact to protected species is reasonably certain to occur. Based on the following factors, the implementation of Alternative 1 or 2 as compared to the NAA would not result in growth-inducing impacts in the Cross Valley service area.

- The purpose of this project is to renew water service contracts, consistent with the provisions of CVPIA. This would continue beneficial use of water developed and managed as part of the CVP, with a reasonable balance among competing demands, including the needs of irrigation and domestic uses; fish and wildlife protection, restoration, and mitigation; fish and wildlife enhancement; power generation; recreation; and other water uses, consistent with requirements imposed by the State Board and the CVPIA.
- The LTCRs do not include an increase in the total contract volumes and will be limited by the existing CVP contract. Because there is no new water, the contract does not induce greater economic development or growth in the Study Area.
- The LTCRs do not involve construction, enlargement, or alteration of the facilities in the Study Area. The construction of new CVP facilities or enlargement of existing conveyance systems are not included in the LTCRs to induce growth.
- Considering the decreased availability of CVP water to contractors and the predicted fallowing of agricultural lands, it is not likely that the Contractors will be converting native lands to agricultural lands as a result of the proposed actions.

The following assumptions were used in the impact analysis:

- Contracts will be renewed under all alternatives.
- No new expansion of CVP deliveries or place of use will occur during the contract period of 25 years.
- No new farmland will be brought into production during the contract period of 25 years.
- No additional land retirement beyond that assumed in the CVPIA PEIS.

The primary factors that will impact land use are the availability and price of water. Water supply availability and pricing mechanisms of the alternatives are discussed in Section 2, Description of Alternatives.

Alternatives Impact Analysis

The technical memorandum “Economic Analysis of November 1999 Tiered Pricing Proposal for PEIS Alternative” (CH2M Hill 2000) updated the economic analysis presented in the PEIS using 1999 water rates and Reclamation’s November 1999 Tiered Pricing Proposal (Category 1 and 2 water).

The analysis presented in the memorandum applied the new water rates and the November 1999 proposal to the Preferred Alternative and compared the results to the impact analysis of the PEIS Preferred Alternative. The PEIS Preferred Alternative is this EA’s NAA; and for the land use impact analysis, the impacts of Alternative 1 are assumed to be the same as the NAA since water supply and pricing are the same in each, and the only differences in the alternatives are administrative.

The application of the 1999 water rates and Reclamation’s tiered pricing proposal to the PEIS Preferred Alternative represents Alternative 2 in this EA. Therefore, the analysis presented in the technical memorandum represents a comparison of Alternative 2 with the NAA.

Agricultural Land Use

The agricultural land use and economic analysis in the technical memorandum assumed that contractors blend the price of all CVP water received at tiered prices into a single rate. Tiered rates to growers are assumed in the PEIS.

The modeling and underlying data were the same as used in the PEIS. Ground water hydrology was not assessed as it was in the PEIS alternatives. Therefore, for purposes of analysis, most regions were assumed to have access to replacement ground water if needed, including the Cross Valley Canal Unit.

The economic analysis and data presented in the technical memorandum were derived from the Central Valley Production Model (CVPM) which was used in the PEIS. This model breaks crop production down into regions and subregions. The Cross Valley Contractor service area is contained within the Tulare Lake Region. At the subregion level, the Cross Valley Canal service area is contained in subregions 17, 18, and 20, but does not account for all of the acreage included in the CVPM for these subregions. The CVPM also includes non-CVP lands in its analysis. The Cross Valley Canal service area lands represent approximately 18% of the land included in the three subregions and therefore the irrigated acres in the Affected Environment will not match the irrigated acreage used in this impact analysis. However, for this analysis, the impacts generated by the CVPM for subregions 17, 18 and 20 will be considered the same as the impacts to the Cross Valley Canal service area.

No Action Alternative

The NAA serves as a basis to measure impacts of the other alternatives. The NAA and Alternative 1 irrigated acreage numbers are assumed to be the same as those shown in the table for the PEIS Preferred Alternative.

Table LU-5 summarizes the estimated irrigated acres by subregion for the NAA and Alternative 1. The estimated number of irrigated acres in the three subregions for an average water year is 1,055,500 acres. In a wet year the total irrigated acres of the three subregions only increases by an estimated 2,800 acres or approximately 0.3%. In a dry year the irrigated acreage within the three subregions is estimated to decrease by an estimated 23,600 acres, or approximately 2.2%.

Table LU-5
Irrigated Acreage, No Action Alternative

Subregion	Average Year	Wet Year	Dry Year
17	260.1	260.3	255.3
18	592.5	594.9	577.2
20	202.5	203.0	199.3
Total	1,055.4	1,058.2	1,031.8

Source: CH2M HILL 2000

Note: All acreage values in thousands af.

These changes are relatively small because of the high percentage of land in the subregions planted in permanent crops and the availability of ground water as a replacement for decreased CVP supplies. The subregion which shows the greatest decrease in acres in a dry year is subregion 18. This is due to the large amount of cotton grown in the subregion and the fact that the CVPM attributes acreage reduction in dry years primarily to cotton and other row crops, such as alfalfa.

Alternative 1

As previously stated, for this analysis, the NAA and Alternative 1 have the same environmental consequences because of their similarities and the fact that the only differences are administrative between the parties to the contracts.

Alternative 2

Alternative 2 includes tiered water prices based on the November 1999 proposal to the Preferred Alternative (Category 1 and 2) and 1999 water rates. The impacts to irrigated acreage within the three subregions are detailed in the CH2M Hill technical memorandum and are summarized in Table LU-6 (CH2M Hill 2000). The table shows the comparison of average, wet, and dry NAA irrigated acreage to the Alternate 2 acreages estimated to be irrigated in average, wet, and dry years following a series of average, wet, and dry years (5-year average-Category 1 water). The number of acres shown in Table LU-6 includes all of the land in the subregions (CVP and non-CVP) and is assumed to represent the impacts to the Cross Valley Canal service area.

Table LU-6
Irrigated Acreage Alternative 2

Subregion	NAA Avg	Changes compared to			NAA Wet	Changes compared to			NAA Dry	Changes compared to		
		Average NAA				Wet NAA				Dry NAA		
		Avg	Wet	Dry		Avg	Wet	Dry		Avg	Wet	Dry
		Followed by Average				Followed by Wet				Followed by Dry		
17	260.1	0.0	0.0	0.0	260.3	0.0	0.0	0.0	255.3	0.0	0.0	0.0
18	592.5	0.0	0.0	-0.1	594.9	-1.2	-1.2	-1.2	577.2	0.1	0.1	0.1
20	202.8	0.0	0.0	0.0	203.0	0.0	0.0	0.0	199.3	0.0	0.0	0.0
Total	1,055.4	0.0	0.0	-0.1	1,058.2	-1.2	-1.2	-1.2	1,031.8	0.1	0.1	0.1

Source: CH2M Hill 2000

Note: All values in thousands af.

In all average years under Alternative 2 there is virtually no change in irrigated acreage as compared to the NAA average year. For all dry years under Alternative 2 there is virtually no change in irrigated acreage as compared to the NAA dry year. In wet years under Alternative 2 there are reductions in irrigated acres of 1,200 acres (0.1%) as compared to the NAA wet year. This reduction occurs in subregion 18 and is comprised of reductions in cotton, alfalfa, and other field crop acreage.

Cumulative Effects

The implementation of any of the three alternatives along with any other foreseeable actions would have little or no impact on agricultural and M&I land use in the Cross Valley Contractor service area.

Therefore, the implementation of any of the three alternatives with other foreseeable actions would not result in any addition to the cumulative impacts that would substantially alter historical agricultural or M&I land use.

BIOLOGICAL RESOURCES

Affected Environment

The Cross Valley Canal covers an extensive area in the San Joaquin Valley including parts of Fresno, Tulare, and Kern Counties, and a very small portion in southeastern Kings County (Atwell Island Water District). The following sections discuss the vegetation and wildlife resources that may be affected by the project. Appendix A presents a list of federal and California special-status species that are known to inhabit these counties.

Cross Valley Canal

The Cross Valley Canal right-of-way is not considered desirable habitat due to routine maintenance, traffic, and weed and pest control. The concrete lined canal does not allow vegetation to become established within the canal. Therefore, the continued operation of the Cross Valley Canal will not result in any significant biological impacts.

Contract Service Area

Major land use within the Cross Valley Contractor service area includes natural or native habitats (36,691 acres), agriculture (132,878 acres), and urban areas (17,277 acres) (Table BR-1). Major natural areas include grasslands (native and nonnative), oak woodlands, riparian areas, and freshwater aquatic communities (seasonal wetlands, vernal pools, and ponds) (Holland 1986, Mayer and Laudenslayer 1988, and Holland and Keil 1989, Hickman 1993). Tables BR-2 and BR-3 lists those special-status species most likely to occur within the Cross Valley Contractor service area. Agricultural areas include row crops, vineyards, orchards, grains, cotton, pastures, and dairies.

Table BR-1
Summary of CVP Cross Valley Contractor Land Use or Habitat Types

Contractor	Agriculture^a	Habitat Type (acres)	
		Natural or Native^b	Urban
Alpaugh ID ^c	7,243	3,346	96
Atwater Island WD ^{c,d}	4,450	2,687	0
Hills Valley ID ^e	2,323	910	40
Kern-Tulare WD ^{c,f}	16,321	9,078	106
Pixley ID ^c	60,629	11,583	1,302
Rag Gulch WD ^{c,f}	36,431	5,879	3,214
Tri-Valley WD ^e	1,863	2,476	114
Total	129,260	35,959	14,872

Source: David Scroggs, pers. comm., CDWR, Fresno, CA 1999

Note:

^a Includes irrigated and non-irrigated lands.

^d 1996 Kings County data.

^b Includes wetland and riparian habitats.

^e 1994 Fresno County data.

^c 1993 Tulare County data.

^f 1990 Kern County data.

Table BR-2
Special Status Species Observed or Expected in the
Cross Valley Contractor Service Area

Common Name	Scientific Name	Federal Status	State Status
Plants			
Hoover's Woolly-star	<i>Eriastrum hooveri</i>	T	None
Bakersfield Cactus	<i>Opuntia basilaris</i> var. <i>treleasei</i>	E	E
San Joaquin Woollythreads	<i>Lembertia congdonii</i>	E	None
California Jewelflower	<i>Caulanthus californicus</i>	E	E
Kern Mallow	<i>Eremalche kernensis</i>	E	None
Hairy Orcutt Grass	<i>Orcuttia pilosa</i>	E	E
Hoover's Spurge	<i>Chamaesyce hooveri</i>	T	None
Invertebrates			
Vernal Pool Fairy Shrimp	<i>Branchinecta lynchi</i>	E	None
Vernal Pool Tadpole Shrimp	<i>Lepidurus packardii</i>	E	None
Valley Longhorn Elderberry Beetle	<i>Desmocerus californicus dimorphus</i>	T	None
Threatened or Endangered Animals			
Blunt-nosed Leopard Lizard	<i>Gambelia silus</i>	E	E
Swainson's Hawk	<i>Buteo swainsoni</i>	None	T
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	Delisted	E
Least Bell's Vireo	<i>Vireo bellii pusillus</i>	E	E
Fresno Kangaroo Rat	<i>Dipodomys nitratooides exilis</i>	E	E
Tipton Kangaroo Rat	<i>Dipodomys nitratooides nitratooides</i>	E	E
San Joaquin Kit Fox	<i>Vulpes macrotis mutica</i>	E	T
Species of Concern			
California Tiger Salamander	<i>Ambystoma californiense</i>	FC	SC
Western Spadefoot	<i>Scaphiopus hammondi</i>	None	SC
Western Pond Turtle	<i>Clemmys marmorata</i>	None	SC
California Horned Lizard	<i>Phrynosoma coronatum frontale</i>	None	SC
American White Pelican	<i>Pelecanus erythrorhynchos</i>	None	SC
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	None	SC
White-faced Ibis	<i>Plegadis chihi</i>	None	SC
Osprey Pandion	<i>Pandion haliaetus</i>	None	SC
Northern Harrier	<i>Circus cyaneus</i>	None	SC
Sharp-shinned hawk	<i>Accipiter striatus</i>	None	SC
Cooper's Hawk	<i>Accipiter cooperii</i>	None	SC
Ferruginous Hawk	<i>Buteo regalis</i>	None	SC
Golden Eagle	<i>Aquila chrysaetos</i>	None	SC
Merlin	<i>Falco columbarius</i>	None	SC
Prairie Falcon	<i>Falco mexicanus</i>	None	SC
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	None	SC
Mountain Plover	<i>Charadrius montanus</i>	FC	SC
Long-billed Curlew	<i>Numenius americanus</i>	None	SC
California Gull	<i>Larus californicus</i>	None	SC

Table BR-2
Special Status Species Observed or Expected in the
Cross Valley Contractor Service Area

Common Name	Scientific Name	Federal Status	State Status
California Horned Lark	<i>Eremophila alpestris actia</i>	None	SC
Yellow Warbler	<i>Dendroica petechia</i>	None	SC
Tricolored Blackbird	<i>Agelaius tricolor</i>	None	SC
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	None	SC
Pallid Bat	<i>Antrozous pallidus</i>	None	SC
Tulare Grasshopper Mouse	<i>Onychomys torridus ramona tularensis</i>	None	SC

Note:

E	Endangered
T	Threatened
FC	Candidate Species
SC	Species of special concern

Table BR-3
Vascular Plants Listed as Rare or Endangered by the California Native Plant Society
Observed or Expected to Occur in the Cross Valley Contractor Service Area

Common Name	Scientific Name	California Native Plant Society List
Coulter's Goldfields	<i>Lasthenia glabrata ssp. coulteri</i>	1B
Hispid Bird's-beak	<i>Cordylanthus mollis ssp. hispidus</i>	1B
Jared's Pepper-grass	<i>Lepidium jaredii ssp. jaredii</i>	1B
Lost Hills Crownscale	<i>Atriplex vallicola</i>	1B
Munz's Tidy-tips	<i>Layia munzii</i>	1B
Panoche Pepper-grass	<i>Lepidium jaredii ssp. album</i>	1B
Recurved Larkspur	<i>Delphinium recurvatum</i>	1B
Sanford's Arrowhead	<i>Sagittaria sanfordii</i>	1B
Slough Thistle	<i>Cirsium crassicaule</i>	1B
Spiney-sepaled Button Celery	<i>Eryngium spinosepalum</i>	1B
Stinkbells	<i>Fritillaria agrestis</i>	4
Tree Anemone	<i>Carpenteria californica</i>	1B

Note:

Vascular plants listed as rare or endangered by the California Native Plant Society (Skinner and Pavlik 1994), but which have no designated status under state endangered species legislation, are defined as follows:

- List 1B. Plants rare, threatened, or endangered in California and elsewhere.
- List 2. Plants rare, threatened, or endangered in California, but more numerous elsewhere.
- List 3. Plants about which we need more information - A review list.
- List 4. Plants of limited distribution - A watch list.

Habitats Within the Cross Valley Contractor Service Area

Valley Grassland Community (includes Non-native Grasslands, Valley Needlegrass Grassland, Valley Sacaton Grassland, Valley Wildrye Grassland, and Wildflower Fields). Grassland communities within

the natural areas of the Cross Valley Canal can be divided into non-native grasslands and relic native communities. Non-native Grassland is the most wide-spread and intermingles with remnant native communities of all types. It is dominated by non-native, annual grass species such as wild oats (*Avena fatua*), ripgut brome (*Bromus diandrus*), soft chess (*B. hordeaceus*), red foxtail chess (*Bromus madritensis rubens*), foxtail (*Hordeum murinum*), wild rye (*Lolium multiflorum*), and annual fescues (*Vulpia sp.*). The most common non-native forbs include mustard (*Brassica sp.*) and filaree (*Erodium sp.*).

Relic native communities include Valley Needlegrass Grassland, Valley Sacaton Grassland, Valley Wildrye Grassland, and Wildflower fields. Valley Needlegrass Grassland typically occurs on fine-textured soils in openings in oak savanna. Once dominated by perennial bunch grasses such as purple needlegrass (*Nassella pulchra*) and slender needle grass (*N. lepida*), most remnants are dominated by introduced annual species. Valley Sacaton Grasslands occur on poorly drained, alkaline soils. Dominant species include perennial, bunch grass alkali sacaton (*Sporobolus airoides*) and salt grass (*Distichlis spicata*). Valley Wildrye Grassland occurs on moist sites at low elevations, often in openings in riparian forest habitats. Soils are typically subalkaline and experience seasonal flooding. The sod-forming perennial grass leymus (*Leymus triticoides*) dominates. Remnant wildflower fields are dominated by non-native annual grass species and are characterized by brilliant displays of spring-blooming forbs such as California poppy (*Eschscholzia californica*), lupine (*Lupinus sp.*), trefoil, rusty popcornflower, and layia (*Layia sp.*). Other common native forbs include fiddleneck (*Amsinckia sp.*), gilia (*Gilia sp.*), goldfields (*Lasthenia californica*), linanthus (*Linanthus sp.*), owl's clover (*Orthocarpus spp.*), and phacelia (*Phacelia spp.*). These are all spring flowering plants and most are annuals. Common summer and fall flowering plants include tarweeds (*Lagophylla spp.*), turkey mullein, vinegar weed, and buckwheat (*Eriogonum spp.*). An annual native grass species would include wild barley (*Hordeum depressum*). Some of the grassland areas also have vernal pools present, which have their own unique characteristics (see vernal pool description below).

Resident grassland birds of Study Area include the Western Meadowlark (*Sturnella neglecta*), Mourning Dove (*Zenaida macroura*), Western Kingbird (*Tyrannus verticalis*), Burrowing Owls (*Athene cunicularia*), and Horned Larks (*Eremophila alpestris*). In the winter these species are joined by American Pipits (*Anthus rubescens*) and Savannah Sparrows (*Passerculus sandwichensis*) among others. Raptors, which nest and roost in adjacent riparian habitats, hunt here. Raptors that would be expected in the grassland area include the White-tail Kite (*Elanus caeruleus*), Red-tailed Hawk (*Buteo jamaicensis*), Golden Eagle (*Aquila chrysaetos*), American Kestrel (*Falco sparverius*), Barn Owl (*Tyto alba*), Great Horned Owl (*Bubo virginianus*), Short-eared Owl (*Asio flammeus*), Turkey Vulture (*Cathartes aura*), Northern Harrier (*Circus cyaneus*), and Prairie Falcon (*Falco mexicanus*).

Large populations of small mammals provide a primary source of prey for many predators. The most obvious small mammal, the California ground squirrel (*Spermophilus beecheyi*), occurs in numerous scattered colonies. Grasslands also provide an abundant food supply for small mammals such as the deer mouse (*Peromyscus maniculatus*), Botta's pocket gopher (*Thomomys bottae*), the black-tailed hare (*Lepus californicus*), western harvest mouse (*Reithrodontomys megalotis*), and California vole (*Microtus californicus*).

In turn, these small mammals serve as prey for coyotes (*Canis latrans*), red foxes (*Vulpes vulpes*), badgers (*Taxidea taxus*), the endangered San Joaquin kit fox (*Vulpes macrotis mutica*), and avian predators.

Annual grasslands provide habitat for a variety of amphibian and reptile species. The Gilbert's skink (*Eumeces gilberti*) and western fence lizard (*Sceloporus occidentalis*) occur here, especially along fence lines and grassland edges where they are close to cover. Gopher snakes (*Pituophis melanoleucus*) commonly hunt lizards and small mammals in grasslands. Other reptilian species expected to occur include the common garter snake, California horned lizard (*Phrynosoma coronatum* frontale), western rattlesnake (*Crotalus viridis*) and the endangered blunt-nosed leopard lizard (*Gambelia silus*).

Oak Woodland Communities. Oak woodlands occur at elevations ranging from 10 to 1,500 meters (30 to 5,000 feet) in the foothills of the Sierra mountain range and San Joaquin Valley. These woodlands are dominated by trees that are 5 to 21 meters (15 to 70 feet) in height and vary from open savannas to dense, closed-canopy communities. The most common type consists of scattered trees and scrubs with an understory of grasses and forbs. Oak woodland areas are often more dense on the north-facing slopes compared to the south-facing slopes. At higher elevations, oak woodlands are often more dense and have a greater species diversity compared to lower levels. The understory of an oak woodland includes grasses and forbs previously described above and shrubs such as California buckeye and redbud (*Cercis occidentalis*). There are two groups of Oak Woodland Communities in the San Joaquin Valley region; 1) Valley Oak Woodland Communities and 2) Foothill Woodland Communities. Valley Oak Woodland is the predominant type that exists within the Cross Valley Canal contract service area.

Valley Oak Communities (includes Valley Oak Woodland). Valley Oak Woodlands mix into foothill woodlands, but are generally restricted to deep alluvial valley soils at low elevations which parallel riparian communities. Other oak species tend to occur on shallower soils on slopes. Valley oak stand densities range from open savanna to dense forest savanna and valley oak is often the only canopy species. The understory is typically composed of non-native grasses and forbs as described above. Most of the valley oaks in the San Joaquin Valley have been removed for cultivation and urbanization. A few scattered stands remain in the valley in areas around dwellings and in parks. Unfortunately very little regeneration has occurred, primarily due to livestock grazing.

Valley oak woodlands provide important food and cover for many species of wildlife. Oak trees are used for foraging, shelter, nesting, and loafing by a variety of avian and mammalian species. Avian species that would be expected in an valley oak community include the Red-shouldered Hawk, Red-tailed Hawk, California Quail, Plain Titmouse, Western Scrub-jay, Spotted (or *Rufous-sided*) Towhee (*Pipilo maculatus*), Bewick's Wren, Bushtit (*Psaltiriparus minimus*), and Acorn Woodpecker. Mammalian species include the mule deer, western gray squirrel (*Sciurus griseus*), bobcat, coyote, western harvest mouse, Botta's pocket gopher, California vole, and deer mouse. Reptilian species include the western fence lizard, common garter snake, and western rattlesnake.

Riparian Communities. Riparian Communities occur along the rivers, numerous creeks, and sloughs within the Cross Valley Canal service contract area. Riparian communities usually consist of one or more deciduous tree species plus an assortment of shrubs and herbs that border streams, rivers, lakes, and springs. Trees vary from tall, dense forests to a scattering of a few individual trees. The extent of riparian vegetation also varies depending on the size and nature of the banks and floodplains, by the amount of water carried by the waterway, and the depth of the aquifers. The existence of a riparian community is dependent upon a permanent water supply. The microenvironment varies depending on seasonal fluctuation of light availability to the understory. During the winter, deciduous trees are dormant and leafless, allowing direct sunlight to the understory vegetation. Some of the herbaceous plants and shrubs grow and flower with the addition of sunlight. During the summer, broadleaf deciduous trees can provide dense shade, resulting in decreased sunlight, which provides for cooler temperatures and higher humidities within the riparian corridor.

Valley and Foothill Riparian Communities (includes Great Valley Willow Scrub, Great Valley Cottonwood Riparian Forest, White Alder Riparian Forest, Great Valley Mixed Riparian Forest, and Great Valley Oak Riparian Forest). Valley and Foothill Riparian Communities occur from the Central Valley floor to the lower elevation margins of the montane coniferous forest of cismontane California. These riparian zones can vary from broad valley floodplain forests to narrow, steep canyon streams. The dominant trees or shrubs include: white alder, Oregon ash, western sycamore, Fremont's cottonwood, valley oak, red willow, Gooding's (or black) willow, and arroyo willow (*Salix lasiolepis*). Common evergreens include interior live oak, California bay-laurel (*Umbellularia californica*), and a noxious exotic weed, salt cedar or Tamarisk. Common shrubs include: seep willow (*Baccharis salicifolia*), button-willow (*Cephalanthus occidentalis*), dogwoods (*Cornus spp.*), California wild rose (*Rosa californica*), blackberries (*Rubus spp.*), elderberries (*Sambucus spp.*), California grape (*Vitis californica*), and poison oak. Herbaceous species include: spikenard (*Aralia californica*), mugwort (*Artemisia douglasiana*), sedges (*Carex spp.*), flat-sedges (*Cyperus spp.*), spike-rushes (*Eleocharis spp.*), willow-herbs (*Epilobium spp.*), horsetails (*Equisetum spp.*), rushes (*Juncus spp.*), monkeyflowers (*Mimulus spp.*), watercress (*Nasturtium officinale*), bulrushes (*Scirpus spp.*), stinging nettle (*Urtica holosericea*), and cattail. Below is a brief description of the specific riparian communities that potentially could occur within the Cross Valley Canal contract service area.

Great Valley Willow Scrub occupies frequently inundated floodplains and banks of major rivers and smaller streams. It is characterized by dense, shrubby thickets dominated by willow species including narrow-leaved willow (*Salix exigua*), arroyo willow, red willow, and dusky willow (*S. melanopsis*). Associated species include California wild rose and Fremont's cottonwood.

Great Valley Cottonwood Riparian Forest occurs in alluvial soils near streams that provide subsurface irrigation year-round. These sites are subject to spring inundation. Characteristic species include Fremont's cottonwood, assorted willows, box elder (*Acer negundo*), and Oregon ash.

White Alder Riparian Forest occurs along rapidly flowing, well aerated, perennial, canyon streams that experience substantial scouring and high flows during spring runoff. Canyons are typically deeply incised, resulting in a narrow riparian corridor.

Great Valley Mixed Riparian Forest occurs further back from river and stream banks, where flooding and scouring events are less frequent and severe. Dominant species are typically winter deciduous and include California walnut (*Juglans hindsii*), white alder, western sycamore, Fremont's cottonwood, box elder, and assorted willow species.

Great Valley Oak Riparian also occurs further back from river and stream banks, where less physical disturbance occurs during flooding. Dominant species include valley oak, California walnut, white alder, western sycamore, Oregon ash, blackberries, and poison oak.

Valley and Foothill Riparian Communities provide food, cover, water, migration and movement corridors, escape, nesting, and thermal cover for a wide diversity of wildlife species. Expected wildlife species would be similar to species previously described in the Oak Woodland and Valley Grassland Communities.

Additional species include water dependent species such as the Wood Duck (*Aix sponsa*), Mallard (*Anas platyrhynchos*), Great Blue Heron (*Ardea herodias*), Great Egret (*Ardea alba*), Snowy Egret (*Egretta thula*), and beaver.

Freshwater Aquatic Communities. Freshwater aquatic communities occur in still and flowing waters and can range in size from small pools to small reservoirs or stock ponds throughout the Cross Valley Canal service contract area. Areas that are seasonally wet also support freshwater aquatic environments. Aquatic communities vary and are dependent on several interacting environmental factors including: species composition, water depths, water level fluctuations, water flow rates, water and air temperatures, other climatic variables, pH, dissolved salts, organic content of the water, nature and depth of bottom sediments, and history of the body of water. Deep, open water areas support submergent or floating aquatic plant communities. Shallow water areas generally support emergent vegetation. Seasonal wetlands are temporary and usually become dry during the summer. Water levels in artificial reservoirs (i.e. livestock or farm ponds, irrigation storage ponds) often fluctuate, preventing well-developed aquatic communities from becoming established. There are two main types of freshwater aquatic communities present: 1) limnetic communities which occur in open water and 2) littoral communities which occur in shallow water and along shores of open bodies of water. Littoral communities include freshwater marshes, bogs, montane meadows, and vernal pools.

Limnetic Plant Communities (includes lakes, reservoirs, irrigation, and stock ponds). Limnetic plant communities have both algal and higher plant components. The algal component is primarily plankton with a variety of algal species. Vascular plants include: hornwort (*Ceratophyllum demersum*), elodea (*Elodea canadensis*), quillwort (*Isoetes spp.*), water-milfoil (*Myriophyllum spp.*), water-nymphs (*Najas spp.*), and pondweeds (*Potamogeton spp.*). Floating plants include: water fern (*Azolla filiculoides*), hornwort, duckweed (*Lemna spp.*) water buttercup (*Ranunculus aquatilis*), and bladderwort (*Utricularia spp.*).

Open ponds provide feeding and loafing areas for a variety of birds including the Eared Grebe (*Podiceps nigricollis*), Western Grebe (*Aechmophorus occidentalis*), Clark's Grebe (*A. clarkii*), American White Pelican (*Pelecanus erythrorhynchos*), Double-crested Cormorant (*Phalacrocorax auritus*), American Coot, and waterfowl such as the Canvasback (*Aythya valisineria*), Redhead (*Aythya americana*), Lesser Scaup (*Aythya affinis*), Mallard, Northern Pintail (*Anas acuta*), Northern Shoveler (*Anas clypeata*), and Canada Goose (*Branta canadensis*). Depending on their location, reservoirs provide a water source for a variety of terrestrial wildlife including coyotes, badgers, striped skunks, weasels, California Quail, and passerine birds.

Freshwater Marsh Communities (includes Freshwater Seeps, Valley Freshwater Marsh, and Vernal Marsh). Freshwater marsh communities develop in locations with slow-moving or stagnant water. These communities occur along margins of ponds and lakes and in the floodplains of slow moving streams and rivers. Marshes can also develop where seepage from springs or shallow water tables allow rooted aquatic plants to become established. Common marsh plants include sedges (*Carex spp.*), spikerushes, bulrushes, bur reeds (*Sparganium spp.*), cattail, Tule (*Scirpus acutus*), water hemlock (*Cicuta maculata*), willow-herbs (*Epilobium spp.*), common monkeyflower (*Mimulus guttatus*), watercress, smartweeds (*Polygonum spp.*), dock (*Rumex spp.*), pondweed, duckweed, and widgeongrass (*Ruppia spp.*).

Freshwater marshes are among the most productive wildlife habitats in California, providing a diversity of habitats for a wide variety of wildlife species. This habitat provides foraging, loafing, and cover areas for species such as the Mallard, Northern Pintail, Gadwall (*Anas strepera*), Green-winged Teal (*Anas crecca*), Cinnamon Teal (*Anas cyanoptera*), Canada Goose, White-fronted Goose (*Anser albifrons*), American Coot, American Bittern (*Botaurus lentiginosus*), Green Heron (*Butorides striatus*), Great Egret, Snowy Egret, Great Blue Heron, Northern Harrier, Red-tailed hawk, dowitcher (*Limnodromus sp.*), Least Sandpiper (*Calidris minutilla*), Western Sandpiper (*Calidris mauri*), Black-bellied Plover (*Pluvialis squatarola*), Killdeer (*Charadrius vociferus*), Dunlin (*Calidris alpina*), American Avocet (*Recurvirostra americana*), and Black-necked Stilt (*Himantopus mexicanus*). Mammals include the California vole, muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), coyote, striped skunk, and long-tailed weasel. Amphibians and reptiles that depend on or utilize freshwater marshes include the western toad, western spadefoot (*Scaphiopus hammondi*), pacific treefrog, western pond turtle, and gopher snake.

Vernal Pool Communities (includes Northern Hardpan Vernal Pools, Northern Basalt Flow Vernal Pools, and Northern Volcanic Mudflow Vernal Pools). Vernal pools are seasonal, shallow, ephemeral bodies of water that occupy depressions in grassland and woodland areas. The pools are underlain by an impervious layer of hardpan, claypan, or bedrock covered with a layer of clay or silt, which results in the collection and ponding of water during winter and spring rains. These pools are generally a few centimeters deep and seldom are more than a meter in depth. The pools gradually dry, resulting in a series of concentric rings of herbaceous vegetation forming around the pool margins.

Species composition in the pools varies in accordance with chemical and physical properties such as salinity, alkalinity (pH), depth, and duration of the pool. Most species that occur within vernal pools are endemic to California and require seasonal inundation followed by desiccation to complete their life cycles. Relative to other community types, vernal pools still support a high percentage of native vegetative cover. Vernal pools are characterized by herbaceous plants that begin as aquatic plants and make a transition to a dry land environment as the pools dry in late spring and summer. Most vernal pool vegetation is comprised of annual herbs with some deeply rooted rhizome type perennials. Vernal pool plant species include: foxtail, water starwort (*Callitriche spp.*), hairgrass (*Deschampsia danthonioides*), downingia (*Downingia spp.*), rush (*Juncus spp.*), flowering quillwort (*Lilaea scilloides*), meadowfoam (*Limnanthes douglasii*), tricolor monkeyflower (*Mimulus tricolor*), orcuttia (*Orcuttia spp.*), allocarya (*Plagiobothrys spp.*), popcornflower, woolyheads (*Psilocarphus spp.*), quillwort, water-clover fern, white brodiaea (*Brodiaea hyacinthina*), slender spikerush (*Eleocharis acicularis*), and coyote thistle (*Eryngium spp.*). Vernal pools lack trees or shrubs. The Cross Valley Canal contract service area contains several distinct types of vernal pools including Northern Hardpan, Northern Basalt Flow, and Northern Volcanic Mudflow Vernal Pools.

Animal species that are vernal pool dependent include special-status species such as the fairy shrimp (*Branchinecta lynchi*), longhorn fairy shrimp (*Branchinecta longiantenna*), vernal pool tadpole shrimp (*Lepidurus packardii*), California tiger salamander (*Ambystoma californiense*), and western spadefoot. Common invertebrate species would include the California linderiella (*Linderiella occidentalis*). Migrating birds such the Mallard, Cinnamon Teal, Black-necked Stilt, and Greater Yellowlegs feed and

loaf in vernal pools during spring migration. Other avian and mammalian species that would utilize a vernal pool and its surrounding area include species that are listed in the Grassland Community section.

Anthropogenic Communities and Agricultural Areas. Much of the San Joaquin Valley's vegetation has been altered by human activities including urbanization, roads and highways, livestock grazing, and

agriculture. Communities dominated by introduced plants and established or maintained by human disturbance are referred to as anthropogenic communities. Anthropogenic communities include : 1) agrestal communities, 2) pastoral communities, 3) ruderal communities, 4) plantations, and 5) the urban mix. Agrestal communities are in areas that have been disturbed by cultivation and thrive in the same environment as agricultural crops. Pastoral communities are dominated by species that are adapted to livestock grazing. Valley grassland communities have become a type of pastoral community. Ruderal communities are highly disturbed areas such as roadsides and similar disturbed sites in towns and cities. Plantations are areas that have been planted with trees such as windbreaks and orchards. Urban mix habitats are areas where nonnative plant species have escaped or been planted in and around urban and residential developments. It is not uncommon to find a mix of native and non-native plants in urban open areas. The local urban mix is difficult to classify due to the variety and vast number of cultivated species introduced into the urban setting.

Anthropogenic Communities provide some wildlife habitat values to native animal species, as well as to non-native species such as the House Sparrow (*Passer domesticus*), European Starling (*Sturnus vulgaris*), Rock Dove (*Columba livia*), black rat (*Rattus rattus*), and house mouse (*Mus musculus*). Wintering waterfowl and coots could be expected to forage on park and golf course lawns. Trees and shrubs provide nesting, roosting, and foraging areas for native species such as the Northern Mockingbird (*Mimus polyglottos*), Mourning Dove, Brewer's Blackbird (*Euphagus cyanocephalus*), American Crow (*Corvus brachyrhynchos*), and Raven (*Corvus corax*), as well as for hummingbirds, and other song birds. Mammals that would be expected in an urban setting include the Virginia opossum, striped skunk, Botta's pocket gopher, ground and tree squirrels, and bats.

Agricultural areas provide cover, foraging, and loafing areas for a variety of wildlife. Pre-irrigated grain fields provide food and loafing areas for migrating and wintering waterfowl, shorebirds, gulls, and terns. Standing grain and alfalfa fields provide feeding, nesting, and escape cover for ducks such as the Mallard, Gadwall, and Cinnamon Teal, and for blackbirds. Grain and alfalfa fields support rodent populations which in turn provide hunting areas for avian and mammalian predators. Irrigated alfalfa fields provide foraging areas for gulls and egrets. Open, fallow fields provide areas for wintering species such as the Mountain Plover (*Charadrius montanus*). Fallow fields with vegetation can provide cover and food for small mammals, which provide hunting areas for avian and terrestrial predators. Orchards provide nesting and roosting areas for species such as Mourning Doves and other passerines, as well as, habitat for mammalian species such as the California ground squirrel.

Environmental Consequences

No Action Alternative

Under the NAA, all existing Cross Valley Canal management continue to operate under current existing conditions. No significant impacts to vegetation and wildlife are expected, since no additional infrastructure (i.e., dams, increase in dam heights, canals, etc.) will be constructed. Additionally, under

this alternative, there will be no increase in deliveries and no conversion of existing natural habitat into farmland.

Alternative 1

Alternative 1 is similar to the NAA. Therefore, there are no impacts to biological resources under this alternative.

Alternative 2

This Alternative is similar to the NAA and Alternative 1, but additional water costs above Alternative 1 costs could potentially increase the amount of fallowed lands and further decrease affordable water for private wetlands within the service area.

Primary reasons for the development and maintenance of private wetlands in the region include duck clubs, the economic benefits realized by landowners through the Food Securities Act Wetland Program (administered through the Natural Resources Conservation Service-NRCS), and larger initiatives currently being planned or developed in the region (e.g., Central Valley Joint Venture and Ducks Unlimited's Valley Care Program). Many of these efforts require the allocation and purchase of water to be successful.

Increased water costs may create a barrier to future development of these programs. In addition, the increased costs could reduce the amount of water available to any lands that are currently under the Wetland Reserve Program, or other private wetlands such as waterfowl hunting clubs. As the cost of water increases, the opportunity to provide wetland habitat by private landowners generally decreases. This could result in some decrease in availability of wetland habitat in the Cross Valley Contractor service area.

Cumulative Effects

No Action Alternative

Under this Alternative, all Cross Valley Canal Unit management will continue to operate as under the current existing conditions. No changes in land use will be created by the project, therefore no cumulative impact on biological resources is anticipated.

Alternative 1

Cumulative impacts for this Alternative would be similar to those described under the NAA. In general little or no change in current land use will be created through this action. Should implementation of this alternative result in some acreage currently in agriculture being fallowed, such fallowing could have an incremental positive effect on sensitive vegetation and wildlife of the region by providing more natural habitat conditions where none currently exist. Hence, no negative cumulative impact on biological resources is anticipated.

Alternative 2

The potential for cumulative impacts for the Alternative would be similar to Alternative 1. Therefore, there would be no demonstrable contribution to cumulative effects.

RECREATIONAL RESOURCES

Affected Environment

While recreational boating, camping, picnicking, and sightseeing are water-dependant opportunities within the Cross Valley Contractor service area, waterfowl hunting and fishing are the primary water-dependant recreational activities affected by CVP water deliveries. Water from the CVP supports regional hunting and fishing activities by flooding the waterfowl refuges and hunting areas and conveying water through canals that support warm water fishing opportunities. The PEIS has based its assessment of impacts on recreational resources primarily upon projected changes in water levels at reservoirs and in rivers, changes in refuge conditions, and the associated changes in visitor usage. Data were compiled and are presented to characterize recreation conditions at lakes, reservoirs, and rivers in the PEIS. Additionally, the PEIS provides a description of the affected environment including facilities and activities at national wildlife refuges, wildlife management areas, and private hunting clubs in the Cross Valley Canal Unit (Reclamation 1999). The Pixley National Wildlife Refuge is the only wildlife refuge within the Cross Valley Canal service area.

In 1991, 39 private water fowl hunting clubs were reported for the Tulare Basin Region (i.e., Kern and Tulare counties), totaling approximate 15,700 acres. These hunting clubs flooded approximately 4,800 acres annually with hunting activity at about 8,200 hunter days. Flooded acres on water districts used for hunting were estimated to account for 22 % (1,016 acres) of the total area flooded for water fowl hunting in the Tulare Basin Region (Reclamation 1994a).

Sportfishing in the Tulare Basin Region was projected to account for 11.8 million angler days in 1990. Fishing occurs primarily on rivers and lakes on the west slope of the Sierra Nevada and along the California Aqueduct. Most sportfishing that occurs in the CVP canals is for resident warmwater species, although no portion of the Friant-Kern, Madera, and Cross Valley canals is designated for public access fishing. Fishing in the canals is limited because of the small number of fish in the canals, access constraints, and the availability of fishing opportunities on nearby reservoirs and rivers (Reclamation 1986).

To expand on the recreational resources presented in the PEIS, the EA focuses on Millerton Lake.

Millerton Lake

Millerton Lake is located on the San Joaquin River about 25 miles northeast of the city of Fresno and 25 miles east of the city of Madera. Structures associated with the lake are comprised of the 319-foot-high concrete gravity Friant Dam, a 332-foot-wide concrete spillway, and an extensive channel system. With a gross storage capacity of 520,500 af, a maximum volume of 290,000 af is allocated during flood seasons for flood control storage. The Madera and Friant-Kern canals carry water from Millerton Lake

to the north and south. Four river outlets divert water into the 152.9-mile-long Friant-Kern Canal flowing south to the Tulare Lake Basin at the southern end of the San Joaquin Valley. The 35.9-mile-long Madera Canal diverts water north from Friant Dam to Madera Irrigation District and Chowchilla Water District.

Millerton Lake State Recreation area is three miles wide at its widest point stretching more than 16 miles up the river canyon, with about 43 miles of shoreline for recreational activities. Facilities provided at the lake include 138 car access campsites, 30 boat access campsites, hundreds of picnic sites, and boating launch ramps. A marina is located on the south shore near the park headquarters. Activities at the lake include swimming, boating, waterskiing, hiking, camping, and horseback riding.

Environmental Consequences

No Action Alternative

The facilities associated in the Cross Valley Contractor service area would continue to operate in a manner consistent with historic conditions. Lake fluctuation would remain dependent upon the volume of inflow, the volume of water in storage, and the volume of water needed to meet downstream needs. During drier periods or multiple years of prolonged drought, Millerton Lake surface water elevations would be subject to substantial decline as water is released to meet downstream needs and demands.

Recreational activities on the lake are expected to respond according to the water storage volumes, similar to past reservoir elevation patterns. With surface water reductions during drought years, water recreationists would travel greater distances from existing roadways and lake access. However, no recreational uses would be precluded during periods of lake drawdown. These conditions would not change under the NAA.

Recreation opportunities on the upper San Joaquin River would not change because no change in operation would occur on Millerton Lake. Water deliveries to the Pixley National Wildlife Refuge would not change.

Alternative 1

Impacts to recreational resources associated with Alternative 1 are assumed to have similar effects as the NAA. No change would occur in the operation of the lakes or water deliveries to the wildlife refuge. Recreation opportunities would not change under Alternative 1 and there are no impacts from this alternative.

Alternative 2

The impact to Alternative 2 is similar to the NAA. The facilities associated with the Cross Valley service area would continue to operate in a manner consistent with historic conditions. Lake fluctuation would remain dependent upon the volume of inflow, the volume of water in storage, and the volume of water released to meet downstream needs. Recreation opportunities on the upper San Joaquin River would not change because no change would occur in operation at lakes or water deliveries to the wildlife refuge. The recreational opportunities and uses anticipated under the NAA would also apply to Alternative 2. There is no impact of this alternative on recreational resources in this region.

Cumulative Impacts

Lake fluctuation would remain dependant on volume inflow, storage, and downstream needs. Implementation of Alternatives 1 or 2 would not contribute to the cumulative impacts from other projects to recreational resource in the region.

SOCIOECONOMIC RESOURCES

Affected Environment

The Cross Valley Canal Contractors service area is a part of the economy of the San Joaquin Valley. In conjunction with implementing CVPIA, substantial changes in agricultural production, income, and employment are possible. In addition, economic impacts on agriculture will have a multiplier or induced impact effect on the rest of the regional and statewide economy. In this section the economic impacts of the LTCCR will be evaluated.

The service area's eight water districts are located within portions of Fresno, Kern, and Tulare counties and encompass portions of the most important agricultural production areas in the Central Valley and the state. All of these counties have a per capita income lower than the state average and unemployment rates approaching double the state average based on 1997 data (Table SE-1).

Table SE-1
County-Level Socioeconomic Data

County	1997 Population	1997 Civilian Labor Force	1997 Employment	1997 Per Capita Income	1997 Unemployment Rate (% of)
Fresno	786,800	376,200	322,500	\$18,329	14.3%
Kern	639,800	279,300	245,400	\$17,848	12.1%
Tulare	360,400	163,800	138,200	\$16,144	15.6%
Totals	2,105,700	957,100	824,300		
California Average	--	15,511,600	14,391,500	\$25,368	6.3%
California Total	33,252,000				

Sources: EDD 1999, EDD 1999a; CDF 1998

The three counties encompassing the service area are amongst the state's top counties for agricultural production value, generating over 30% of the state's production in 1998 and contain 1% of the irrigated land in California (Table SE-2 and SE-3).

Table SE-2
Cross Valley Contractor County Agricultural Production

County	1998 California Rank	1998 Production (\$1,000)	% of Total California Value	Leading Crops
Fresno	1	3,286,806	12.0%	Grapes, Cotton, Poultry
Kern	2	2,922,057	8.5%	Grapes, Cotton, Almonds
Tulare	3	2,067,678	8.3%	Milk, Grapes, Oranges
Totals		8,276,541	28.9%	
California Total	--	26,941,832	--	

Source: USDA 1997a

Due to its heavy agricultural focus, 82% of the service area's land is irrigated. The Cross Valley Contractors service area receives water from the CVP, other surface water sources, and ground water pumped from on-farm sources. In 1987, total farm deliveries of water amounted to over 273,000 af (FWUA 1998). Ground water contributed 82% of the service area supply. The Cross Valley Contractors have CVP contracts holding 128,300 af of water. Over 64,000 af were delivered from the CVP, accounting for 23 % of Cross Valley's total water supply (FWUA1998).

Table SE-3
Irrigated Acreage and CVP Deliveries

County	District	1996 Irrigated Acreage	Maximum Contract Amount (af)
Cross Valley		168,913	
	Hills Valley Irrigation District		
Fresno		3,996	3,346
Kern	Kern-Tulare Water District	11,130	40,000
	Lower Tule River Irrigation District		
Tulare		87,890	31,102
Tulare	Pixley Irrigation District	60,726	31,102
Kern/Tulare	Rag Gulch Water District	5,171	13,300

Source: Reclamation 2000a

Notes: Tri-Valley Water District is exempt from reporting crop water needs information.

No data are available for the Fresno and Tulare Counties for 1996.

The Cross Valley Contractors service area produces a diverse range of crops on 166,980 acres of agricultural land: grains and field crops, nuts, cotton, and vegetables (Table SE-4). Several of the districts were not required to report crop water use information in 1996 due to limited irrigation acreage. From the reported information, alfalfa was the most plentiful crop in the area with over 19% of the crop land devoted to its harvest. Lower Tule River Irrigation District led the Contractors in acreage for most of its major crops. The District had 32,000 acres of alfalfa, and 28,000 acres of cotton. Cotton and corn were planted on over 16% and 13%, respectively, of Cross Valley's agricultural land. Ten other crops each contributed less than 10% of the crop land in the service area (Reclamation 1999b).

Table SE-4
1996 District Crop Acreage

Crop	Hills Valley Irrigation District	Kern-Tulare Water District	Lower Tule River Irrigation District	Pixley Irrigation District	Rag Gulch Water District	Total
Alfalfa	0	80	20,635	11,284	320	32,319
Almonds	0	529	0	0	0	529
Barley	154	0	0	0	0	154
Citrus	2,444	0	88	0	0	2,532
Corn	0	0	22,629	0	0	22,629
Cotton	0	0	19,024	8,961	0	27,985
Deciduous Orchard	56	934	3772	487	55	5,304
Grain	0	0	11,118	0	0	11,118
Grapes	494	4,193	2,810	4,511	3,479	15,487
Miscellaneous	0	0	0	22,573	0	22,573
Misc. Field	0	0	890	0	0	890
Misc. Truck	0	0	0	986	0	986
Nuts	85	0	3,359	3,219	0	6,663
Olives	120	0	0	0	0	120
Pasture	0	0	551	1,364	0	1,915
Pumpkins	0	100	0	0	0	100
Subtropical Orchard	0	7,707	0	0	1,077	8,784
Sugar Beet	0	0	418	0	0	418
Truck Crop	0	0	1,077	0	0	1,077
Wheat	0	157	0	0	240	397
Total	3,353	13,700	86,371	53,385	5,171	166,980

Source: Reclamation 1999b

Note: Tri-Valley Water District is exempt from reporting crop water needs information.

No data are available for the County of Fresno and the County of Tulare for 1996.

Lower Tule River included in Friant Division EA.

Within the Kern County portion of the Cross Valley Contractors service area, the most abundant of the seven crops were from subtropical orchards, which accompany approximately 8,800 acres. Citrus fruits were the primary crop in the Fresno Irrigation District, the only unit District within Fresno County, comprising approximately 73 % of the county's unit acres (Reclamation 1999b).

The Cross Valley Contractors service area is a significant contributor to the production of several crops in California. Of the 706,731 acres of the grapes grown in California, 51 % are within the three counties that encompass the Cross Valley service area (Figure SE-1). The Cross Valley unit is also a substantial supplier of cotton (CASS 1995).

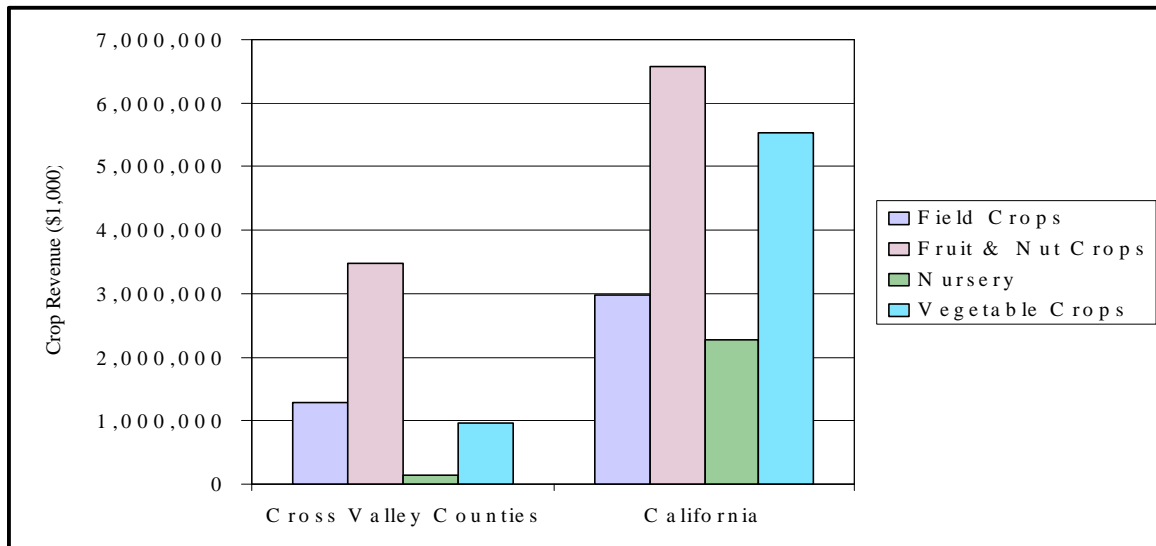


Figure SE-1
Crop Revenue Distribution for Cross Valley Counties and California
Source: Reclamation 1999b

CVP contract rates for project water in the service area average \$21.95 per af. Hills Valley Irrigation District has the least expensive rate of \$21.09/af and Tulare County is the most expensive at \$23.83/af (Reclamation 1999b).

On-farm water application efficiency is a function of evapotranspiration and the amount of water delivered to the farm. Application efficiencies in the Central Valley range from around 50 to 80 % (Reclamation, 1999a). The Cross Valley Unit lies in the high part of that range. With an average efficiency of 79%. Ground water replenishment averages approximately 73,000 af/yr (FWUA1998).

In 1996, the Cross Valley Contractors service area generated almost \$120 million in crop revenue (Table SE-5), which is 1% of the revenue for its three counties. Cross Valley's agricultural revenue was less than 1% of the Central Valley's revenue for 1996. The Lower Tule River Irrigation District generated over half of that revenue with \$58 million in 1996. Hills Valley Irrigation District and Kern-Tulare Water District each contributed approximately 17% of the service area's production (Reclamation, 1999a, 1999b). The greatest revenues generally came from the crops with the highest irrigated acreages. Grapes were the largest revenue producers contributing \$34 million dollars. Cotton and alfalfa crops followed with \$28 and \$22 million in revenue respectively. The top two districts made up 75% of the Cross Valley service area's revenue and had contracts for only 53% of its water (Table SE-6).

Table SE-5
1996 Crop Revenue (\$)

Crop	Hills Valley Irrigation District	Kern-Tulare Water District	Lower Tule River Irrigation District	Pixley Irrigation District	Rag Gulch Water District	Total
Alfalfa	\$0	\$53,680	\$13,846,000	\$7,571,564	\$214,720	\$21,685,964
Almonds	\$0	\$842,168	\$0	\$0	\$0	\$842,168
Barley	\$32,543	\$0	\$0	\$0	\$0	\$32,543
Citrus	\$9,100,935	\$0	\$328,000	\$0	\$0	\$9,428,935
Corn	\$0	\$0	\$10,590,000	\$0	\$0	\$10,590,000
Cotton	\$0	\$0	\$19,214,000	\$9,050,610	\$0	\$28,264,610
Deciduous Orchard	--	--	--	--	--	\$0
Grain	\$0	\$0	\$2,713,000	\$0	\$0	\$2,713,000
Grapes	\$1,085,333	\$9,218,311	\$6,178,000	\$9,917,434	\$7,648,582	\$34,047,659
Miscellaneous	--	--	--	--	--	\$0
Misc. Truck	\$0	\$0	\$4,867,000	\$4,455,734	\$0	\$9,322,734
Nuts	--	--	--	--	--	\$0
Olives	\$227,160	\$0	\$0	\$0	\$0	\$227,160
Pasture	\$0	\$0	\$90,000	\$222,332	\$0	\$312,332
Pumpkins	--	--	--	--	--	\$0
Subtropical Orchard	--	--	--	--	--	\$0
Sugar Beets	\$0	\$0	\$380,000	\$0	\$0	\$380,000
Wheat	\$0	\$51,025	\$0	\$0	\$78,000	\$129,025
Total	\$10,445,971	\$10,165,184	\$58,206,000	\$31,217,674	\$7,941,302	\$117,976,131

Sources: 1999, Reclamation 1999a

Note: Crop revenue for Lower Tule River Irrigation District includes revenue received as both a Cross Valley and Faint Contractor.

Table SE-6
District Crop Revenue and Contract Water

Reporting Districts	Maximum Contract Amount (af/yr)	1996 Crop Revenue (\$)	Cumulative Revenue (\$)
Lower Tule River Irrigation District	31,102	\$58,206,000	\$58,206,000
Pixley Irrigation District	31,102	\$31,217,674	\$31,217,674
Hills Valley Irrigation District	2,146	\$10,445,971	\$41,663,644
Kern-Tulare Water District	40,000	\$10,165,184	\$51,828,828
Rag Gulch Water District	13,300	\$7,941,302	\$59,770,129

Sources: FWUA 1998; Reclamation 2000a

Environmental Consequences

The majority of the data presented in this assessment is derived from the (CVPM). The CVPM, as defined in the Draft PEIS, is “a regional model of irrigated agricultural production and economics that simulates the decisions of agricultural producers (farmers) in the Central Valley of California.” The CVPM contains 22 crop production regions. The Cross Valley Contractors service area falls into three of the CVPM’s 22 subregions that include subregions 17, 18, and 20. While the Contractors service area is contained within these three subregions, it should be noted that the existing conditions as described in this section for the service area are less than 100% of the production units used in the CVPM, because the CVPM subregions include both CVP and non-CVP users. For example, the total irrigated acreage from the affected environment section of this EA will be different (lower) than the irrigated acreage used in this analysis. For the purposes of these analyses, the impacts generated by the CVPM for subregions 17, 18, and 20 will be considered the same as the impacts to the Cross Valley Contractors service area.

No Action Alternative

The impacts to acreage, agricultural output, and employment are reported from the Final PEIS Alternative 1, dated October 1999. The assumptions used in the analysis and the results are detailed in that report. The PEIS Alternative 1 output was considered equivalent to the output for the PEIS Preferred Alternative and was applied to the NAA for this EA. The NAA for this EA includes dedication of water for alternative uses, restoration payments, tiered water prices, and land retirement.

The distribution of the crop acreages among the service area’s CVPM subregions estimated for the NAA in the average year water condition total 1,055,000 acres. In a wet year this total is raised by less than 1%. In a dry year the total drops by about 2%, which is a change of less than 1% of the Central Valley total irrigated acreage for an average year. CVPM subregion 18 contributed to the majority of this drop in acreage, losing 15,000 acres in a dry year (Table SE-7). These changes are relatively small, and they are consistent with changes due to weather and commodity demand.

Table SE-7
Cross Valley Contractor Subregion Irrigated Acreage in the No Action Alternative

CVPM Subregion	Average Year (1922-90)	Wet Year (1967-71)	Dry Year (1928-34)
17	260	260	256
18	592	595	577
20	203	204	199
Total	1,055	1,059	1,032

Source: Reclamation 1999a

Note: All acreage values in thousands.

Gross revenues for the Cross Valley subregions for the PEIS NAA average total to \$2.1 million, which is 21% of total Central Valley gross revenue. In a dry year gross revenue falls by less than 1% of this total, with subregion 18 once again contributing half of the lost revenue. In a wet year gross revenue is increased by less than 1% of the average year total (Table SE-8).

Table SE-8**Cross Valley Contractor Subregion Gross Revenue (Value of Production) in the No Action Alternative**

CVPM Subregion	Average Year 1922-1990	Wet Year 1967-1971	Dry Year 1928-1934
17	565.7	565.7	562.0
18	974.2	976.1	961.5
20	603.9	604.1	600.4
Total	2,143.8	2,145.9	2,123.9

Source: CH2M Hill 2000

Note: All values in millions of 1992 dollars.

The Cross Valley subregion produces about 22% of the Central Valley net income total. In a wet year net income decreases to about 4%, of the Central Valley net total with the majority of the decrease resulting from irrigation cost. In a dry year, net income decreases even more to about 2% of the Central Valley total, with the majority of the decrease resulting from ground water pumping cost (Table SE-9).

Table SE-9**Cross Valley Contractor Subregion Net Revenue in the No Action Alternative**

CVPM Subregion	Average Year 1922-1990	Wet Year 1967-1971	Dry Year 1928-1934
17	142.9	54.2	41.5
18	294.7	25.3	-3.4
20	136.5	31.5	17.2
Total	574.1	111.0	55.3

Source: CH2M Hill 2000

Note:

All values in millions of 1992 dollars.

Compared to the NAA average, there is an increase in total ground water usage of about 610 af and a decrease in total CVP water usage of about 180 af under the NAA dry scenario of the PEIS. The NAA wet scenario shows a decrease in total ground water use of about 370 af and a slight increase in total CVP water use of about 20 af compared to the NAA Average scenario (Table SE-10). These water source estimates give insight into the insignificant changes in agricultural output and revenue summarized in the previous sections. While there is insignificant change in output and revenue under the NAA, there is a substantial tradeoff between CVP water and ground water, with total ground water use in a dry year increasing by 35% and in a wet year decreasing by 27%. The evidence shows that when surface water supplies are restricted farmers will switch to ground water, greatly softening the economic impacts of changes in CVP supplies. It should be noted, that in production areas where ground water resources are not readily available or are of poor quality, localized impacts could result.

Table SE-10
Cross Valley Contractor Subregion Irrigation Water Applied

CVPM Subregion	Water Source	Average Year (1922-90)	Wet Year (1967-71)	Dry Year (1928-34)
17	CVP Water	34.6	32.5	27.1
	Ground water	415.1	303.2	577.4
18	CVP Water	517.3	526.3	399.0
	Ground water	1,018.0	821.8	1,334.9
20	CVP Water	208.7	219.8	154.1
	Ground water	303.6	244.8	437.3
Total	CVP Water	760.6	778.6	580.2
	Ground water	1,736.7	1,369.8	2,349.6

Source: CH2M Hill 2000

Note: All values in thousands af.

The PEIS estimated the total employment impacts for California to be about 2,790 jobs, \$183 million in output, and \$79.6 million in place-of-work (PoW) income. Most of these impacts occur in agricultural regions where CVP water prices cause substantial decreases in agricultural output. The estimates from the PEIS IMPLAN employment multipliers indicate about 20 jobs per million dollars of output (See Draft Technical Appendix, Regional Economics, Table II-2, Page II-5). Therefore, the less than 1% increase in wet year Central Valley output will increase total employment in the Central Valley by about 130 jobs. The dry year analysis shows that a less than 1% decrease in output for the Central Valley will result in a decrease of about 935 jobs for the region, a very small percentage of the total regional employment impact of the implementation of PEIS. Therefore, it is concluded that no employment impacts are likely to occur.

Alternative 1

The impacts are similar to the NAA. Therefore, impacts on agricultural output and revenue and employment impacts are not anticipated within the Cross Valley Contractors service area.

Alternative 2

The impacts to acreage, agricultural output, and employment are derived from the “*Economic Analysis of November 1999 Tiered Pricing Proposal for PEIS Preferred Alternative*”(CH2M Hill 2000). The assumptions are used in the analysis and the results are detailed in that report. This alternative includes tiered water prices based on the November 1999 proposal to the PEIS Preferred Alternative and 1999 water rates.

Changes in irrigated acreage within Cross Valley Contractor service area from the NAA are summarized by crop in Table SE-11. Less than 1% of the service area’s irrigated acres are lost compared with the NAA wet, when a wet year follows a series of dry years. This reduction is the largest in irrigated acreage due to the implementation of the tiered pricing procedure described in Alternative 2. According to this tiered pricing procedure, the amount of water that is eligible for Category 1 classification shrinks when a series of dry years is experienced because of the fact that the quantity of Category 1 water is based on the average deliveries of the previous five years. This being the case, when a series of average or dry years is followed by a wet year a large portion of the water that is available is classified as Category 2 and is priced at the Full Cost Rate. When this Full Cost Rate water is, integrated into the blended water price,

all CVP water supplies become more expensive. The less than 1% change in irrigated acreage in the dry-wet scenario, like change under the NAA, is relatively small and is consistent with changes due to weather and commodity demand.

Table SE-11
Cross Valley Contractor Subregion Irrigated Acreage in Alternative 2

CVPM Subregion	Changes Compared to Average NAA			Changes Compared to Wet NAA			Changes Compared to Dry NAA		
	Avg.	Wet	Dry	Avg.	Wet	Dry	Avg.	Wet	Dry
	Followed by Average			Followed by Wet			Followed by Dry		
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	-0.1	-1.2	-1.2	-1.2	0.1	0.1	0.1
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	-0.1	-1.2	-1.2	-1.2	0.1	0.1	0.1

Source: CH2M Hill 2000

Note: All values in thousand acres.

Gross revenue impacts are very similar to the acreage impacts, and are shown in Table SE-12. Compared to the NAA wet, a reduction of \$1 million is estimated for all scenarios ending in a wet year. Each of these scenarios impacts gross revenue in the Cross Valley subregions by less than 1%, if at all.

Table SE-12
Cross Valley Subcontractor Subregion Gross Revenue (Value of Production) in Alternative 2

CVPM Subregion	Changes Compared to Average NAA			Changes Compared to Wet NAA			Changes Compared to Dry NAA		
	Avg.	Wet	Dry	Avg.	Wet	Dry	Avg.	Wet	Dry
	Followed by Average			Followed by Wet			Followed by Dry		
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	-0.1	-1.0	-1.0	-1.0	0.1	0.1	0.1
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	-0.1	-1	-1	-1	0.1	0.1	0.1

Source: CH2M Hill 2000

Note: All values in millions of dollars.

Estimated changes in net revenue within the service area are the largest for the dry-wet and dry-average scenarios. For the series of dry years followed by a wet year, net revenue is decreased by less than 1% of the contractor's total net revenue compared to the NAA average year results. When dry years were followed by an average year the net revenue decreased by an even smaller percentage (Table SE-13). When a dry year follows a series of average or wet years, there is a positive impact to net revenue. This positive impact, however small, has two probable causes: (1) some of Cross Valley's subregions are forced to reduce their

acreage because of higher blended CVP water prices, resulting in higher crop prices received for acreage that remains in production, and (2) more revenue is available due to CVP water cost because large amounts of CVP water are no longer affordable and are not purchased. CVPM subregion 18 in Tulare County has the highest increase in net revenue due to CVP water cost.

Table SE-13
Cross Valley Contractor Subregion Net Revenue in Alternative 2

CVPM Subregion	Changes Compared to Average NAA			Changes Compared to Wet NAA			Changes Compared to Dry NAA		
	Avg.	Wet	Dry	Avg.	Wet	Dry	Avg.	Wet	Dry
	Followed by Average			Followed by Wet			Followed by Dry		
17	0.0	0.1	0.1	0.0	0.0	-0.1	0.0	0.0	-0.1
18	-1.5	-1.0	-2.9	-2.1	-1.6	-3.7	0.8	0.8	0.0
20	-0.1	0.2	-0.8	-0.3	0.0	-1.1	-0.3	-0.3	-0.7
Total	-1.6	-0.7	-3.6	-2.4	-1.6	-4.9	0.5	0.5	-0.8

Source: CH2M Hill 2000

Note: All values in millions of dollars.

Compared to the NAA wet year within the service area, CVP water usage increases by less than 1% and ground water usage decreases by less than 1% under the dry-wet scenario (Table SE-14). A general shift occurs towards CVP water and away from ground water under all scenarios as CVP water becomes cheaper than pumping ground water under the blended pricing scheme proposed under Alternative 2, which in turn leads individuals to maximize their CVP water use. These data differ from the evidence provided under the NAA analysis but, in fact, show an almost negligible difference in comparison with that analysis. In the Alternative 2 analysis, water supplies other than CVP project water and ground water are unaffected and not shown.

Table SE-14
Cross Valley Contractor Subregion Irrigation Water Applied in Alternative 2

CVPM Subregion	Water Source	Changes Compared to Average NAA			Changes Compared to Wet NAA			Changes Compared to Dry NAA		
		Avg.	Wet	Dry	Avg.	Wet	Dry	Avg.	Wet	Dry
		Followed by Average			Followed by Wet			Followed by Dry		
17	CVP Water	3.9	3.8	4.0	7.4	7.3	7.4	0.0	0.0	0.1
	Ground water	-3.8	-3.8	-3.9	-7.4	-7.2	-7.4	0.0	0.0	0.0
18	CVP Water	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1
	Ground water	0.0	0.0	-0.1	-4.0	-4.0	-3.8	0.0	0.0	0.0
20	CVP Water	0.1	0.1	-0.2	0.1	0.1	-0.1	0.0	0.0	-0.1
	Ground water	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total	CVP Water	4.0	3.9	3.9	7.5	7.4	7.4	0.0	0.0	0.1
	Ground water	-3.9	-3.9	-3.9	-11.4	-11.2	-11.2	0.0	0.0	0.0

Source: CH2M Hill 2000

Note: All values in thousands af.

The Alternative 2 analysis estimated the total California impacts for the average-average scenario compared to the NAA to include total direct and indirect losses of about 530 jobs, \$34 million in output, and \$18.6 million of PoW income. Each of these losses amounts to less than 1% of the Central Valley total. Under the average-dry scenario, the negative total impacts to the state economy for jobs, output, and PoW income also do not exceed 1% of the Central Valley totals. The average-wet sequence produces even smaller negative impacts than the average-dry scenario. It is concluded, therefore, that there will be no impact to the total regional employment due to the implementation of Alternative 2.

Cumulative Effects

Implementation of Alternatives 1 and 2 would continue a historic pattern of water use within the Cross Valley Contractors service area. These alternatives in combination with other foreseeable actions would likely have little or no impact on agricultural water deliveries and maintain historical average water supplies. Therefore, the implementation of either of the alternatives would not result in any addition to cumulative impacts that would substantially affect agricultural output, revenue, and employment.

CULTURAL RESOURCES

Affected Environment

For cultural resources (archaeological and historical sites, and traditional cultural properties), the area of potential effect (APE) consists of the service areas of the water districts included in the Cross Valley Contractor service area. The service area consists of eight water districts in Fresno, Kern, and Tulare counties and includes mostly agricultural users but also some municipal and industrial users. Cumulatively the districts encompass approximately 102,118 acres.

Information Sources and Background Data

The general background discussion provided below was developed from published sources including *California Archaeology* by Michael Moratto (1984) and the *Handbook of North American Indians, Volume 8, California* (1978). The background discussion includes a presentation that establishes the environmental, prehistoric, ethnographic, and historic context for the APE. Specific cultural resource data for the project APE were obtained from the Central California Information Center at California State University Stanislaus and the Southern San Joaquin Valley Information Center at California State University Bakersfield. The Information Centers are part of the California Historical Resources Information System. All recorded archaeological and historical site records for the Study Area were obtained from the Information Centers.

The California Native American Heritage Commission (NAHC) was contacted to request a review of their Sacred Lands files. The NAHC also provided names of Native American groups and individuals it believes might have specific knowledge of traditional cultural properties or other cultural sites on the subject lands. These lists were forwarded to Reclamation, which is conducting government-to-government consultation with federally recognized tribes.

Environmental Setting

The Cross Valley Contractor service area is comprised mostly of valley and foothill lands located in Fresno, Kern, and Tulare counties. This area contains a wide variety of natural habitats, including prairie, oak savanna, marsh, and riparian wetland. The San Joaquin River is the major drainage system for the valley, fed by the Fresno, Kings, Tule, and Kern rivers. Before modern reclamation projects, the San Joaquin Valley contained more than 5000 square kilometers of wetlands, which provided habitat for numerous species, including waterfowl, anadromous and nonanadromous fish, deer, elk, bear, wolves, and smaller mammals. Much of the Cross Valley Contractor service area is located in the ecotone at the base of the Sierra Nevada foothills, an area which blends the resources of the lowland prairie, oak savanna, and coniferous forest and is concomitantly rich in ecological diversity (Moratto 1984). The climate of the area is of the inland Mediterranean type, with hot, dry summers and cool, wet winters. Precipitation for the area averages 50 cm (20 inches), although the valley is wetter in the north and drier in the south.

Cultural Setting

Prehistory

Human presence in San Joaquin Valley is demonstrated from at least 6000 BC, based on a radiocarbon date obtained from an archaeological site located on the western shore of Buena Vista Lake in the southern end of the valley. According to a scheme proposed in the 1930s, this site fits into the earliest phase of three chronological periods that have been employed to organize the prehistory of California. This first phase, known as the Early Horizon and spanning 8000 to 2500 years before present, is associated with an early, hunting-focused culture attracted to the vast herds of large game that frequented the waterways of the valley. This phase was followed by the emergence of a cultural pattern, known as the Middle Horizon, that was more heavily focused on the collection of seeds and other plant food. This phase occurred approximately 2500 to 1100 years ago. The third phase - the Late Horizon, 1100 to 200 before present, includes the Yokuts and their immediate antecedents and saw a shift to a diversified subsistence strategy that encompassed a wide range of plant and animal foods. While this chronological scheme, known as the Central California Taxonomic System, has been revised over the years, it is still used by many archaeologists, albeit in a modified and refined fashion (Wallace 1978).

The material culture and burial practices of the aboriginal populations of the central and southern San Joaquin Valley share features with both the cultures of the Delta and with those of the Santa Barbara coast. Similarities to the Delta region can be seen in the presence of bone sweat scrapers, decorated bone spatulae, and beads of olivella and haliotis shell. However, limpet shell ornaments, a well-developed steatite industry, and the use of wooden grave markers are characteristics shared with the Santa Barbara coast (Elsasser 1978). Burials in the San Joaquin Valley tend to be extended in the Early Horizon, semiflexed in the Middle Horizon, and tightly flexed in the Late Horizon and Protohistoric periods. The amount of burial goods also seems to increase over time (Moratto 1984).

Archaeological research in San Joaquin Valley, especially the southern part, has been limited. Aside from a few large sites around Buena Vista Lake, the area of the valley south of Stockton has not been intensively investigated. The far northern end of San Joaquin Valley, around the Delta, has been more intensively investigated, but is outside the Study Area. It is likely that future investigations will further help to clarify the archaeological record for the area.

Ethnography

Most of the territory encompassed by the Cross Valley Canal service area was occupied at the time of contact by the Yokuts group, the various branches of which occupied most of San Joaquin Valley, its eastern and western foothills, and the eastern part of Delta. The Yokuts language is a member of the Penutian stock, which includes the Miwok and Costanoan (or Ohlone) groups. The Penutian peoples are thought to have entered central California from the northwestern Great Basin beginning around 1500 BC (Moratto 1984) and to have gradually displaced the previous inhabitants, speakers of Hokan and Uto-Aztecan stocks. This hypothetical population movement is associated chronologically with the development of the Windmill pattern in Sacramento Valley, a cultural pattern characterized by diversified food-gathering strategies, including highly developed hunting and fishing technology; the pattern also features extended burials oriented towards the west.

North Valley Yokuts

The territory of the North Valley Yokuts extended from Fresno north to the edge of the Delta, west to the crest of the Diablo Range, and east to the lower foothills of the Sierra. The life of the North Yokuts was centered along the San Joaquin River and its many tributaries, which is flanked by dry, treeless grasslands along its length. The principal food sources for this group were salmon and acorns, both of which were plentiful in areas along the rivers. Procurement of avifauna, big game hunting, and seed collecting also played an important role in subsistence.

Round, single-family dwellings built of reeds were the primary structure in North Yokuts villages, which were usually located on mounds to minimize flood hazards. Basketry and other fiber weaving work constituted the primary craft, accompanied by a lithics industry that manufactured tools from locally obtainable chert, jasper, and chalcedony. Footpaths connected villages, though river travel was also very important. Trade with neighboring peoples such as the Costanoans and Miwok was common.

Disruption of native lifeways began with the establishment of missions in the San Francisco Bay region and the forced conversion, often by kidnapping, of the indigenous peoples of the area. With the secularization of the missions in 1834, many former neophytes, including many North Yokuts, returned to their native regions or villages. The resumption of native lifeways, however, was interrupted by the onset of the Gold Rush. The northern San Joaquin Valley was the principal corridor for the thousands of miners who headed for the Sierra Nevada; later it was a prime choice for farmland. Most of the Native American people and villages in the way of this settlement were annihilated (Wallace 1978).

South Valley Yokuts

The historic homeland of the South Valley Yokuts encompassed the San Joaquin Valley south of Fresno and the surrounding foothills. The most notable aspect of this area was the presence of two large shallow lakes, Buena Vista and Tulare, and numerous rivers, channels, sloughs, and marshes. About 15 South Valley Yokuts groups inhabited this area, each with a different, yet mutually intelligible dialect. Each of these groups averaged about 350 persons. They occupied permanent dwellings, constructed of woven tules, which could house a single family or as many as ten.

The rich estuarine and riverine resources provided by the local environment enabled a more sedentary existence than was typical of most California groups. Diet consisted largely of fish, waterfowl, shellfish, grass seeds, and tule roots. Most toolstone was imported, while other implements, such as arrow shafts or baskets, were made from tule reeds.

The first European contact with the South Valley Yokuts was in 1772, soon after the first Spanish settlement in California. The area was influenced only lightly by missionization: the difficult marshy terrain made it difficult to find either new converts or runaways from mission authority. It was only with the establishment of farms and ranches in the southern Valley after the Gold Rush that the South Valley Yokuts were dispossessed of their land. Today a small remnant of the group lives on the Tule River and Santa Rosa reservations (Wallace 1978).

Foothill Yokuts

The Foothill Yokuts are distinguished from their valley cousins both by their distinct dialects and their foothill habitat. Most Foothill Yokut villages were located between 2,000 and 4,000 feet in the Sierra Foothills, a zone which incorporates diverse life zones including chaparral, coniferous forest, and oak woodland. Their subsistence was focused on hunting and gathering and was highly diversified, with fish playing a much smaller part than in the valley. As in the valley, basketry and stone work were the major crafts, although some simple pottery is attested from central foothills groups (Wallace 1978). In the Cross Valley Canal Unit, Fresno County Waterworks # 34 is within the territory of the Gashowu group of Foothill Yokuts.

Native American Sites

Native American habitation has left many traces on the landscape. The most intensive settlement was located along watercourses, of which the valley had many. In the north part of San Joaquin Valley numerous village sites were located on mounds on or near the natural levees that flank many parts of the San Joaquin River. In the south valley, village sites have been discovered along the shores of the former Buena Vista and Tulare lakes, and more are likely to exist along other waterways. Village sites, often marked by a mound, are characterized by extensive subsurface deposits and sometimes contain human burial sites.

Other types of Native American sites include lithic surface scatters of lithic and other artifacts, which may indicate a temporary camp or specialized tool processing area. Also many bedrock or boulder milling/food-processing stations, characterized by cupules and slicks in the rocks. These stations are often located at natural bedrock outcrops or along perennial streams, which may deposit large boulders of suitable material along their course. Trails, rock art, and isolated artifacts or flakes are other traces of Native American occupation that may be present in the Study Area.

History

The first Europeans to enter the Study Area were Pedro Fages and his expedition, who explored the San Joaquin Valley in 1772. However, most subsequent Spanish settlement in California was concentrated along the coast and adjacent valleys. When Mexico became independent, the government began to give land grants to settlers, including a few in the southern valley in the early 1830s. These settlements often provided the nucleus for present-day cities.

Until the late 1850s, the San Joaquin Valley was sparsely settled by Europeans. Extensive areas of marsh were a hindrance to farming. By the mid-1860s, however, American settlers were beginning to reclaim and drain land for agriculture and ranching. By the 1870s, the San Joaquin Valley was the center of California's wheat production. The introduction of canning technology and transcontinental rail led to widespread diversification and development of specialty crops such as fruits and nuts. About the same time, exploitation of the petroleum resources of the valley began, and continues today. The need for a steady supply of water to irrigate the increasing acreage of farmed land led to the incorporation of water districts, and in 1933 to the introduction of the State Water Plan, which grew into the CVP.

Historic Sites

The Study Area includes a large number of historic sites. The majority of these occur within the confines of historic settlements such as Visalia. However, many other types of historic features that may be found in the landscape include, but are not limited to historic structures; linear features such as roads, trails, railroads, and telegraph lines; features related to historic water transportation, such as canals, ditches, and channels; and homestead - and ranch - related structures.

Cultural Resources Baseline Data

This section presents the results of a record search conducted at the Southern San Joaquin Valley Information Center of the California Historical Resources Information System. A more detailed presentation is provided in the confidential technical appendix to this EA.

Information Sources

Because of the irregular boundaries of the various water districts encompassed in the Cross Valley Contractor service area, the USGS 7.5' quadrangles with coverages including one or more Cross Valley water districts were searched in their entirety. The information requested included:

- A list of recorded historic and prehistoric archaeological sites
- Archaeological sites reported to the Information Center, but not formally recorded
- The California Inventory of Historical Resources for the project counties
- California Points of Historical Interest within the Study Area
- The Directory of Properties in the Historic Properties Data File for the project counties, which includes all properties assessed for the National Register of Historic Places (NRHP) (through September 1999)

- The list of Archaeological Determinations of Eligibility, which includes archaeological sites assessed for inclusion in the NRHP, state, or local registries (through June 1999)

The NAHC also performed a search of their sacred lands file for the Study Area. Numerous sacred sites and other traditional cultural properties are located in or near the Cross Valley Canal Contractor service area. However, specific information is confidential. Reclamation is currently conducting government-to-government contacts with federally recognized tribes who may have information about such sites.

Data Limitations

The data retrieved from the Information Centers carry a number of limitations. Most significant is the fact that only a small percentage of California has been subjected to intensive archaeological survey. Estimated survey percentages for the counties of the Cross Valley Canal service area are as follows (See Draft PEIS II:42, II:50):

- Fresno-5%
- Kern-5%
- Kings-<1 %
- Tulare-2 %

Most archaeological surveys are project-driven; that is, they are conducted in response to a proposed change in land use or new ground-disturbing activity requiring agency review. Therefore, lists of known sites reflect the number of studies performed and do not necessarily reflect the actual density or distribution of archaeological sites. It is likely that the agricultural land that comprises most of the Cross Valley Canal service area has not undergone significant changes in land use that would trigger archaeological investigation. Therefore, it seems probable that even less of the land in the Cross Valley Canal service area has been surveyed than the above percentages would indicate.

In addition, it is likely that historic archaeological sites are underrepresented in the Information Center database, since the recording of historic sites was not common until the 1970s. In addition, the Information Center records may be incomplete because of a backlog in data entry or the failure of individuals or agencies to submit site records or reports. Such information is not reflected in the data presented below.

The data presented in the attached tables distinguish between historic resources that are part of the built environment and those that are archaeological in nature. For the purposes of this report, built environment resources include historic structures or features, such as canals or houses, that are still in use. Archaeological resources, on the other hand, are defined as historic features or structures that are no longer an active part of the built environment. Therefore, inhabited houses or working canals are included in the built environment of the tables, whereas abandoned houses or disused railroad grades are counted as historic archaeological resources.

Search Results

From the record search results, a database was prepared that included the information listed above. Because of the highly irregular boundaries of the water districts within the APE, sites were included in a 500-meter buffer zone outside of the apparent district boundaries to ensure complete coverage. Therefore, the number of sites listed below may slightly exceed those actually within the APE.

117 historic or archaeological resources are known within the Cross Valley Canal Contractors service area. Of these, 57 (48.7 %) are prehistoric archaeological sites; 10 (8.5%) are historic archaeological sites; 2 (1.7%) have both prehistoric and historic archaeological components; and 47 (40.2%) are part of the built environment (see TABLE CR-1).

Table CR-1
Cultural Resources in the Cross Valley Contractor Service Area

District	Prehistoric Sites	Historic Sites	Multicomponent Sites	Built Environment	Total
Alpaugh Irrigation District	3				3
Atwell Island Water District			1		1
City of Visalia	2	0		45	47
Fresno County Water Works #34	36	5	1		42
Hills Valley Irrigation District	4	1			5
Pixley Irrigation District	4	2		3	9
Tri-Valley Water District	8	2			10
Total	57	10	2	48	117

A majority of the built environment resources (45, 93.8%) are located in the City of Visalia water district and are urban in nature, mostly homes, bridges, and canals. Among the prehistoric resources 37 (62.7%) are located within Fresno County Water Works #34, a heavily surveyed area south of Millerton Lake. Few resources remain within the other districts of the Cross Valley Canal service area. As noted above, it is likely that this paucity of sites reflects a lack of cultural resource inventories within the given areas, rather than the absence of historic or prehistoric resources (See Tables CR-2, CR-3).

Table CR-2
Prehistoric Archaeological Resources and Register Status

District	Not NRHP/CRHR eligible	Unevaluated/ status unknown	Total
Alpaugh Irrigation District		3	3
Atwell Island Water District*		1	1
City of Visalia		2	2
Fresno County Water Works #34*	1	36	37
Hills Valley Irrigation District		4	4
Pixley Irrigation District		4	4
Tri-Valley Water District		8	8
Total	1	58	59

Note: Districts marked with a * have one multicomponent site which is counted on both historic and prehistoric tables.

Table CR-3
Historic Archaeological Resources and Register Status

District	NRHP/CRHR eligible	Unevaluated/ status unknown	Total
Atwell Island Irrigation District*		1	1
Fresno County Water Works #34*		6	6
Hills Valley Irrigation District		1	1
Pixley Irrigation District	1	1	2
Tri-Valley Water District		2	2
Totals	1	11	12

Note: Districts marked with a * have one multicomponent site that is counted on both historic and prehistoric tables.

Three built environment resources in the Cross Valley Canal service area are on the NRHP, all of them within Visalia city limits. One historic bridge is listed on the Historic American Building Survey/Historic American Engineering Register (HABS/HAER). Beyond this, 36 historic properties in the Cross Valley Canal service area have been determined eligible for the NRHP. Thirty-five of these are within the City of Visalia water service area, and one is within the Pixley Irrigation District, in downtown Pixley. Of the remaining known resources, two have been determined ineligible for NHRP or California Register of Historic Resources(CRHR), and the rest are unassessed or of unknown status. (See Table CR-4)

Table CR-4
Built Environment Resources and Register Status

District	NRHP or other register	NRHP/ CRHR eligible	Not NRHP eligible	Unevaluated/ status unknown	Not eligible but HABS/ HAER listed	Total
City of Visalia	3	36	1	4	1	45
Pixley Irrigation District	0	0	0	3	0	3
Totals	3	36	1	7	1	48

Regulatory Setting

For federal purposes, a historic property is a cultural resource that is significant under the criteria of eligibility for the NRHP, as defined under 36 Code of Federal Regulations (CFR) 60.4. Historic properties must possess integrity of location, design, workmanship, feeling, and association, and must meet at least one of the following criteria:

- Association with events that have made significant contributions to the broad patterns of the history of the U.S.
- Association with the lives of people significant in U.S. history.
- Embody the distinctive characteristics of a type, period, or method of construction; or represent the work of a master, or possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction.
- Has yielded, or is likely to yield, information important in history or prehistory.

California State Landmarks are assigned a sequential number as they are identified and compiled. Landmarks above number 770 are automatically included in the CRHR while landmarks below number 770 require individual evaluation for inclusion on the CRHR or NRHP.

Environmental Consequences

This section describes the basis for:

- Determining which cultural resources located within the project area have been included, or are considered eligible for inclusion on the NHRP, or are considered significant in accordance with the California Environmental Quality Act (CEQA); and whether additional such resources may remain undiscovered within the water service areas encompassed by the Cross Valley service area.
- Identifying and assessing the potential effects of the contract renewal alternatives under consideration on eligible or potentially eligible or significant cultural resources.

No Action Alternative

The Preferred Alternative is provided in the PEIS for CVPIA. This is the NAA for the Cross Valley Contractor EA. The NAA is described in detail in Section 2. The NAA serves as a baseline for comparison with the other alternatives in the EA. It describes the conditions in the absence of a federal project. Developed from the PEIS Preferred Alternative, the NAA assumes existing CVP facilities in the Cross Valley Canal would continue to use the existing management practices for the CVP. The NAA uses the full contract amount from the previous year. This contract amount does not change whether the contractor takes the water or not; only what is available. Changes to the management direction could affect operation of the CVP water facilities, repayment methods and pricing structures for water and power, water contract renewals, and compliance with federal and state water quality requirements.

Because the NAA assumes renewal of the long-term contracts, it would be considered a federal undertaking. Continued delivery of Cross Canal Valley Unit water would constitute a project with potential for adverse environmental effects pursuant to NEPA.

Impacts could occur due to mowing or trenching through an archaeological site, leveling of a mound, and repeated changes in reservoir impoundment levels, which could result in increased surficial erosion that could expose previously buried sites.

The many archaeological sites within the Cross Valley service area include documented and undocumented prehistoric and historic sites and features, and groups of sites that may qualify as NRHP districts. As well as visible surface manifestations, these sites may include or be primarily composed of subsurface accumulations of cultural material. The importance of such a site, therefore, rests not only on the age and materials present but also on the horizontal and vertical integrity of the soil and its contents.

Under the NAA, all existing Cross Valley Contractor service area management will continue to operate under current existing conditions. No impacts to cultural resources are expected, since no additional infrastructure (i.e. dams, increase in dam heights, canals, etc.) will be constructed. Additionally, under this alternative, there will be no increase in deliveries and no conversion of existing natural habitat into farmland or other uses.

In those LTCCR actions that are not within the range of existing conditions and will affect historic properties, a commitment will be made that Reclamation will comply with Section 106 of the National Historic Preservation Act. In some instances the responsibility to address affects to cultural resources will be with the local government as part of their CEQA compliance for their actions. Such actions are approved locally and at the state level. Reclamation would need to consider the effects to historic properties when Reclamation approves new lands being brought into an irrigation district (Inclusions) and when Reclamation approves a change in use that could lead to an effect on historic property.

In compliance with 36 CFR 800.4(a) (4), Reclamation has sent letters to Indian tribes requesting their input regarding the identification of any properties to which they might attach religious and cultural significance to within the area of potential effect. To date no comments or formal responses have been received from the tribes.

Alternative 1

Alternative 1 is similar to the NAA. Therefore, there are no impacts to cultural resources under this alternative.

Alternative 2

Alternative 2 is similar to the NAA. Therefore, there are no impacts to cultural resources under this alternative.

Cumulative Effects

Under all three Alternatives, all Cross Valley service area management will continue to operate under the existing conditions. No changes in land use will be created by the project, therefore, no cumulative impact on cultural resources is anticipated.

SOCIAL CONDITIONS

Affected Environment

The social conditions in the Cross Valley Contractor service area are described with factors such as employment level, educational opportunities, the income level, the community social structure, and the need for public social assistance programs. These conditions were described in detail for the Tulare Lake Region in the PEIS and are summarized below.

The Cross Valley Contractor service area is predominately rural with numerous small cities. Large communities, such as Fresno and Bakersfield, are also located in the Cross Valley contractor service area. The regional economic indicators of social well being are all measures of the social conditions within a region. For the Tulare Lake Region, the unemployment rate is higher than in urban areas (Table SC-1), attributed to a large seasonal labor market and limited availability of employment in other industries. Unemployment for Fresno, Kern, and Tulare counties ranged from 12.1 to 15.6% in 1997 while statewide unemployment was 6.3% (see Table SE-1). As the farming economy declines, the employment opportunities also decline.

Table SC-1
Regional Demographic and Economic Indicators of Social Well Being

Issues	Tulare Lake Region
Population in 1992	1,031,000
Median Family Income in 1990	\$37,000 - \$32,000
Per Capita Income in 1990	\$10,000 to \$12,000
Poverty Rate in 1990	17% to 23%
Median House Costs in 1990	\$80,000
Unemployment Rate in 1992	15%

Source: EDD 1999

The ethnicity of the Cross Valley Contractor service area is predominately white with Hispanic peoples comprising about 30% of the population in the Tulare Lake Region (Table SC-2). The statewide estimates for poverty and unemployment levels within these ethnic groups are shown in Table SC-3.

Table SC-2
Ethnicity by Tulare Lake Region

Ethnicity (percentage)	Tulare Lake Region (percentage)
White	60
Black	4
Asian	3
Hispanic	33

Source: EDD 1999

Table SC-3
Poverty and Unemployment Rates

Ethnicity (percentage)	Poverty Rate	Unemployment Rate
White	6	4
Black	21	7
Asian	11	4
Hispanic	18	7

Source: EDD 1999

The largest employment opportunity in the region is agricultural. Agricultural employment affects local communities not only as direct labor (farmers, farm workers) but also indirectly through farm equipment, farm supplies, and farm commodity processing.

Within the Cross Valley Contractor service area are two major social groups: farmers, and farm workers and agribusiness workers (EDD 1999). Farmers are individuals who own farmland or manage farm operations. Typically, farmers live within 15 miles of the farm and spend about 85% of farm production costs locally (EDD 1999). Farm workers are people employed to work on a farm, including permanent and seasonal workers. About 41% of the farm workers are seasonal employees. Agribusiness workers are those individuals who are indirectly involved with farm production and employed in businesses that serve the farming community. In 1999, 18.3 to 19% civilian labor force were employed in agriculture in Fresno and Kern Counties. Agriculture accounts for 27% of total employment in Tulare County (EDD 1999).

Environmental Consequences

Environmental Justice

Executive Order 12898 requires that federal agencies address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the U.S. and its territories. This action would not have a disproportionately high adverse affect on any one ethnic group more than another including land owners, farmers, and farm workers. However, this action would reflect more on the individual education and skill level and the type of labor requirements necessary for the agricultural production and services, notably the indirect impacts to farm laborers who are generally economically disadvantaged (Reclamation 1999a).

Impacts on social conditions are recognized if the project results in changes in agricultural production and services that may result in increased unemployment and decreased opportunities.

No Action Alternative

Under the NAA, all existing Cross Valley management and operations will continue as under current conditions. No new or additional CVP facilities will be constructed. Unemployment in the Cross Valley Contractor service area will remain higher than the statewide unemployment rates. Agriculture will remain a large employer in the region.

Alternative 1

Impacts to social conditions associated with the Alternative 1 are expected to have similar effects to social conditions as the NAA. Therefore, there are no impacts from this alternative.

Alternative 2

Maximum reduction in irrigated acres was identified in an economic analysis using the wet water year follow a 5-year sequence of dry years scenario (CH2M Hill 2000). Under this scenario, the economic analysis identified a reduction of 0.1% irrigated acres in the region. This reduction in irrigated acreage would result in no impact to the Cross Valley Contractor service area.

Cumulative Effects

Implementation of any of the alternatives would have no impact to the future social conditions to the cumulative action. The alternative would not contribute to the cumulative impacts of social conditions in the Cross Valley Contractor service area.

AIR QUALITY

Affected Environment

The Cross Valley Contractor service area is within the San Joaquin Valley Air Basin. Comprising about 24,840 square miles, the air basin represents approximately 16% of the geographic area of California and is the second largest air basin in California populated by an estimated 2.9 million persons. Major urban centers in the air basin include Bakersfield, Fresno, Modesto and Stockton.

Air quality is regulated through both federal and California Ambient Air Quality Standards (AAQSs). Federal AAQS establish primary and secondary national AAQSs. National primary standards define air quality levels that are protective of public health while the secondary standards are protective of the public welfare (e.g., degrade the environment, impair visibility, or damage vegetation and property). The potential impacts to these national and state AAQSs from implementation of the CVPIA are discussed and evaluated in the PEIS. However, the PEIS does suggest local regional conditions may require further evaluation. Consequently, the air quality assessment tiers off the PEIS by focusing on regional particulate emissions associated with contract renewals for the Cross Valley Canal.

In 1987, the AAQS established fine particulate matter less than or equal to 10 microns (PM_{10}) at 150 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air during a 24-hour period and $50 \mu\text{g}/\text{m}^3$ on an annual basis. In 1997, PM standards were promulgated by EPA. As a subset of PM_{10} , $PM_{2.5}$ are particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. The $PM_{2.5}$ 24-hour and annual arithmetic standards are 65 and $15 \mu\text{g}/\text{m}^3$, respectively.

By contrast, the California 24-hour and annual average standards are considerably more stringent than the federal 24-hour standards. The state standard is $50 \mu\text{g}/\text{m}^3$ on a 24-hour basis while the annual geometric standard is $30 \mu\text{g}/\text{m}^3$. Air basins that exceeded these values were determined to be nonattainment for PM_{10} . The EPA classified the San Joaquin Valley Air Basin as a serious PM nonattainment area effective February 8, 1993. The San Joaquin Valley Unified Air Pollution Control District is currently implementing a PM_{10} attainment plan to meet the federal standard (SJVUAPCD 1994).

The San Joaquin Valley Air Basin mediterranean-like climate generally consists of hot dry summers and cool wet winters. Approximately 90 % of the rainfall occurs between November and April, with little or no precipitation occurring from late spring to early fall. The San Joaquin Valley floor is characterized by hot, dry summers and cooler winters. The average mean temperature over a 30-year period is 65°F . High daily temperature readings in summer average 95°F in the valley. The valley also experiences mild winters; the winter average daily low temperature is 45°F . Over the last 30 years, the valley averaged 106 days a year at 90°F or hotter and 40 days a year at 100°F or hotter. The daily summer temperature variation can exceed 30°F . The valley has an "inland mediterranean" climate with an average of over 260 sunny days per year.

Semipermanent systems of high barometric pressure fronts frequently establish themselves over the Air Basin, deflecting low pressure systems that might otherwise bring cleansing rain and winds. The strength and duration of the inversion determines the amount of atmospheric mixing that will occur, which subsequently contributes to PM_{10} concentrations in the Air Basin. Low wind speeds, combined with low inversion layers in the winter, create a climate conducive to high PM_{10} concentrations (SJVUAPCD 1994).

Environmental Consequences

Particulate sources that could be affected by contract renewals relate to dust sources associated with retirement and fallowing of agricultural land, the use of heavy farm equipment, and application of pesticides and fertilizers.

No Action Alternative

Under the NAA, the renewal of the contract would not involve the construction of any new facilities or result in land-disturbing activities that could contribute to particulate emissions or construction equipment exhaust.

Continued water supply deliveries will support both existing and future urban and agricultural land uses. However, these land uses do contribute to air pollutants, including emissions of reactive organic gases creating ozone, particulates, and other pollutants. The pollutant emission volume and rate from these land uses is not expected to vary between the NAA and the alternatives.

n the NAA, agricultural land uses in the Central Valley would include similar crops and cropping patterns. It is assumed that retired or fallowed lands would be reseeded with grasses and grazed by livestock or occasionally dryland farmed. These cultivation measures are similar to methods used on lands that have been historically fallowed due to crop rotation or periodic cropping pattern changes.

The current policies and practices of regulatory agencies would continue at the present level of intensity, including the continuation of air quality monitoring and air quality compliance programs within the Air Pollution Control District. Particulate emission programs target PM_{10} from general and specific emissions sources in past years, and are associated with reductions of PM_{10} in the Central Valley. However, it is recognized that this region is in nonattainment for particulates and further efforts to reduce particulate emission in the future are likely to occur. Therefore, because the cultivated and fallowed acreage patterns are similar to historical patterns, it is anticipated that air quality under the NAA would be similar to recent conditions described in the Affected Environment.

Alternative 1

Irrigated acreage under Alternative 1 would be similar to the NAA. It is assumed that the lands to be retired or fallowed would go to seed with grasses and would be grazed by livestock or occasionally dryland farmed. These cultivation measures are similar to methods used on lands that have been historically fallowed due to crop rotation or periodic cropping pattern changes. Therefore, due to limited changes in land use it is anticipated that the level of wind erosion potential would not increase under Alternative 1 as compared to the NAA.

The retirement and fallowing of land would also be associated with reductions in the use of farm equipment and application of pesticides and fertilizers. However, because the percentage of land that would be affected by these changes is small, it is anticipated that air quality conditions resulting from vehicle emissions and pesticide and fertilizer use would not change under Alternative 1 as compared to the NAA.

Alternative 2

The maximum reduction in irrigated acres as compared to the NAA was identified in an economic analysis using the wet water year following a 5-year sequence of dry years scenario (CH2M Hill 2000). Under this scenario, the economic analysis identified a maximum reduction of less than 0.1% of the irrigated acres in the Cross Valley Contractor service area.

It is assumed that the lands to be retired or fallowed would go to seed with grasses and be grazed by livestock or occasionally dryland farmed. These cultivation measures are similar to methods used on lands that have been historically fallowed due to crop rotation or periodic cropping pattern changes. Therefore, due to less than minor changes in land use, it is anticipated that the level of regional wind erosion potential would not increase under Alternative 2 as compared to the NAA.

he retirement and fallowing of land would also be associated with reductions in the use of farm equipment and application of pesticides and fertilizers. However, because the percentage of land that would be affected by these changes is small, it is anticipated that air quality conditions resulting from vehicle emissions and pesticide and fertilizer use would not change under Alternative 2 as compared to the NAA.

Cumulative Effects

Implementation of Alternative 1 and 2 would not contribute to the cumulative impact of air quality. The alternatives do not consider construction of new facilities, generally emission sources that contribute to the cumulative impact.

GEOLOGY AND SOILS

Affected Environment

The Cross Valley Contractor service area is located in the southern San Joaquin Valley north of the city of Bakersfield. The geology and soils impact analysis is primarily based upon soil erosion impacts from changes in agricultural land use and streamflows. A brief discussion of the soils of the southern San Joaquin Valley follows.

The Sierra Nevada is the tallest and most continuous mountain range in California. In the southern Sierra Nevada, elevations range from about 400 feet at the edge of San Joaquin Valley and to 14,000 feet or more at the crest. The Sierra Nevada Province is generally composed of Mesozoic Sierran granitic batholith and associated older metamorphic rocks. The shallow soils of the lower Sierra Nevada foothills to an elevation of about 3,500 feet are moderately deep to deep. The gently rolling to steep foothills surface layer ranges from coarse sandy loam to clay, with a high percentages of clean, well sorted gravel and sand. In general, alluvial sediments of the western and southern parts of the valley tend to have lower permeability than eastside deposits (USDA 1971).

The San Joaquin Valley is composed of tertiary sediments and volcanics. The alluvial fans and plains consist of unconsolidated continental deposits that extend from the edges of the valley toward the valley floor. Derived entirely from runoff from the Sierra Nevada, the alluvial material formed a level to rolling landscape. Soils formed in light to moderately coarse textured alluvium were derived from weathered granitic and sedimentary rock. The alluvial plains cover most of the valley floor and make up some of the intensely developed agricultural lands. The level to gently sloping soils of the valley surface layer ranges from sandy loam to clay. The valley soils are very deep to moderately deep and are well drained (USDA 1982).

Local wind erosion rates climatic factors, soil surface roughness, width of field, and quantity of vegetative cover affect soils and wind erosion of soils. Climatic factors incorporate the moisture of the surface soil. Soil taken out of irrigation and allowed to remain barren with no cover vegetation will have greater losses to wind erosion than the same soils under a good crop and land management program with irrigation. Wind erosion not only impacts vegetation, but also public health, through fugitive particulate emissions. Soils may become shallower, organic matter and needed plant nutrients could be removed, and young plants may be damaged from soil losses and windborne particulates.

Several types of water-based soil erosion exist. In order of increasing erodibility they are sheet, splash, and rill and gully erosion. Some factors that influence the erodibility of soils include land slope, surface texture and structure, infiltration rate, permeability, particle size, and the presence of organic or other cementing materials. Level land erodes less than sloped land because flow velocities are less. Based on this factor alone, terrace and upland soils would be more susceptible to water erosion than soils on the valley floor.

Environmental Consequences

Impacts on soil resources are considered significant if the project results in changes in agricultural land use which may result in increased erosion potential, land subsidence which may result in increased bank erosion and associated siltation problems, land subsidence from ground water overdraft, and decreases in soil quality due to salt accumulation.

No Action Alternative

Water supplies to lands within the Cross Valley Contractor service area would be delivered to the contractors in accordance with the CVPIA and the individual long-term service contracts. All the alternatives would provide water supplies to the respective contracting agencies for their respective contract amount. In the case of agricultural water deliveries, the continued delivery of CVP water would continue the productive use of prime farmlands that are found in the service area.

Implementation of either the NAA or alternatives would not result in impacts to soil. Retired or fallowed lands are assumed to have cover crops planted in the last year of cultivation. The existing policies and programs of Reclamation, as expressed in the CVPIA, provide for protection and conservation of unique soil, mineral, and geologic resources within the service contract area. These plans guide future land and resource use within the CVP service area.

Increased river releases would be in accordance with the CVP operational criteria that include streamflow limitations to protect aquatic species and prevent scouring and bank erosion. Reclamation coordinates the operation of CVP reservoirs with California Department of Fish and Game and the Service to schedule releases that create pulse flows to help “push” the fish downstream.

Alternative 1

Impacts associated with Alternative 1 are expected to have similar impacts as the NAA. Continued application of streamflow considerations in reservoir operations will be applied and will not increase streambed erosion.

Retired or fallowed agricultural production lands are assumed to have a cover crop planted in the last year of cultivation. The cultivation measures and future land use changes are not anticipated to increase the level of erosion as compared to the NAA.

Increased river releases would be in accordance with the CVP operational criteria which include streamflow limitations to protect aquatic species and prevent scouring and bank erosion. Reclamation coordinates the operation of CVP reservoirs with California Department of Fish and Game and the service to schedule releases that create pulse flows to help “push” the fish downstream. Continued application of streamflow considerations in reservoir operations will apply and will not result in additional streambed erosion.

Alternative 2

There would be no reduction to the impact from Alternative 2. The maximum reduction as compared to the NAA in irrigated acres was identified in an economic analysis using the wet water year follow a 5-year sequence of dry years scenario (CH2M Hill 2000). Under this scenario, the economic analysis identified a reduction of 0.1% irrigated acres in the Cross Valley service area.

Retired or fallowed agricultural production lands are assumed to have a cover crop planted in the last year of cultivation. The cultivation measures and future land use changes are not anticipated to increase the level of erosion as compared to the NAA. Continued application of streamflow considerations in reservoir operations will be applied and will not increase streambed erosion.

Under Alternative 2, a single year of decreased ground water pumping will not adversely or beneficially affect the ground water basin. Over the long term the ground water use in subbasin 17 would decrease, based on the CVPM simulations.

Cumulative Effects

The Cross Valley Contractor management and operations will continue with no impact to the existing conditions. Implementation of Alternative 1 or 2 would not contribute to the cumulative impact to the geology and soil from other activities.

VISUAL RESOURCES

Affected Environment

The visual resources focus in the Cross Valley Contractor service area are visual resources located in the eastern portions of the San Joaquin River Region which, includes the Cross Valley Canal.

Visual resource classification is provided using the U.S. Forest Service (USFS) landscape character types and the Visual Management System (VMS). Landscape character types are based on landscapes with similar physiographies (i.e., combinations of landforms), vegetative cover types, and surface water bodies. Based on its total visual character; no single physical characteristic dictates character type, although landform has a stronger influence than other characteristics. The USFS has established criteria

or application of VMS to most landscape features occurring in the State of California (USFS, 1976). Landscape character is rated as follows:

- Variety Class A landscapes are distinctive landscapes with high visual quality. They contain outstanding feature attractions and distinctive varieties in form, line, color, texture, landform, vegetation, and water features. As a rule, Class A landscapes are favored by photographers.
- Variety Class B landscapes are quality landscapes with some variety in form, line, color, or texture. Major, visually dominant features are absent. In general, such landscapes are considered pleasant to view, but are not notably the subject of photographers.
- Variety Class C landscapes are low quality visual landscapes. They are sometimes described as monotonous because they lack variety of form, line, color, and/or texture.

The VMS evaluates the relationship between landforms, vegetation, water, air, and non-man-made structures. The quality of a landscape scene is evaluated using the following criteria: landscape character (based on the public perception of the view), visual sensitivity (based on the proximity of the viewer to the viewshed), and deviations from the characteristic landscape (based on the presence and design of manmade alterations to the landscape). Man-made alterations that borrow from the character of the landscape are considered more harmonious than those that do not borrow their form, line, color, and/or texture from the surrounding area (USFS 1973).

The San Joaquin River and Tulare Lake Regions include two provinces: the Sierra Foothills and Low Coastal Mountain and the Central Valley. Principal CVP facilities in the eastern portions of the San Joaquin River Region include the Cross Valley Canal. The canal offers relatively few road travel viewing opportunities. The canal enhances the visual interest of the landscapes in which it occurs, but the flat land and land uses prevent frequent viewing by travelers on major routes. The service area is predominantly considered Variety Class C, with extensive areas of monotonous landscape. The management standard is maximum modification or modification. Exceptions are those areas where the foothills join the Central Valley to form entrant valleys of agricultural land surrounded by grass-covered and wooded hills, which are considered Variety Class B. The management standard is maximum modification or modification. Urban areas are considered Variety Class C, with management standards of maximum modification and modification.

Environmental Consequences

Impacts to visual resources are dependent upon (1) changes in cropping patterns, which may result in increased fallowed lands and associated modified agricultural viewshed, and (2) releases from storage reservoirs, which may result in a “bathtub ring” caused by the appearance of unvegetated soil at the shoreline between the water surface and the high water line. VMS primary goals are to inventory visual resources and to subsequently provide a means of identifying visual resource management standards for incorporation into forest management plans (Table VR-1) (USFS 1973).

No Action Alternative

The renewal of the contract would not involve the construction of any new facilities or result in land-disturbing activities that could alter the visual environment. Retired or fallowed agricultural production lands are assumed to have a cover crop planted in the last year of cultivation. General cultivated and

fallowed acreage patterns would be similar to historic patterns. The NAA would not have a demonstrable effect on the unique or scenic landscape features.

Alternative 1

Similar to the NAA, Alternative 1 does not involve the construction of any new facilities or result in land-disturbing activities that could alter the visual environment. General cultivated and fallowed acreage patterns would be similar to historic patterns. Alternative 1 would have similar effects to visual resources as the NAA. Therefore, there are no impacts from this alternative.

Alternative 2

The acreage of production lands fallowed would be reduced by a minimal amount. The maximum reduction in irrigated acres was identified in an economic analysis using the wet water year following in a 5-year sequence of dry years scenario (CH2M Hill 2000). Under this scenario, the economic analysis identified a reduction of less than 1% of the irrigated acres in the Cross Valley Contractor service area.

Additionally, retired or fallowed agricultural production lands are assumed to have a cover crop planted in the last year of cultivation. Little change would occur in the agricultural viewshed under Alternative 2 in comparison with the NAA. There would be no impact from Alternative 2 to the visual resources.

Cumulative Effects

Implementation of Alternative 1 or 2 would not contribute to the cumulative effects of this resource area.

SECTION 4

CONSULTATION AND COORDINATION

INTRODUCTION

Prior to preparation of this EA, input was solicited and incorporated from a broad range of cooperating and consulting agencies and the public. This section summarizes the public involvement program and key issues raised by the public and interest groups. This section also addresses the manner in which Federal statutes, implementing regulations, and executive orders potentially applicable to implementation of the CVPIA have been addressed. The conclusions of compliance are based on the Environmental Consequences presented in Section 3. The compliance summaries apply only to the alternatives discussed in this EA and not the development of concurrent CVPIA implementation programs.

PUBLIC INVOLVEMENT

Reclamation started the preparation of this EA with Scoping Meetings. Scoping served as a fact-finding process to identify public concerns and recommendations about the long-term contract renewal issues that would be addressed in this EA and the scope and level of detail for analyses. Scoping activities began in October 1998 after a Notice of Intent to prepare environmental documentation for long-term contract renewals was filed in the Federal Register. The scoping period formally ended in January 1999. The Scoping Report was released in summer of 1999.

Public input continued during long-term contract negotiations to define the contract language. Discussions also were held with the San Felipe Division long-term water service contractors during the preparation of this document.

At public scoping meetings, Reclamation provided information about long-term contract renewal process and solicited public comments, questions, and concerns. At these meetings, participants had numerous comments and questions about how important issues would be considered both in the PEIS and the long-term contract renewal process. The majority of the comments received during the Scoping process addressed the Needs Assessment methodology to be used as part of the long-term contract renewal process. Contract renewal negotiation issues also were addressed. The least number of comments addressed environmental review issues.

Reclamation received numerous comments about issues to be considered in the PEIS and methodologies for analyzing impacts. Comments considering the development of alternatives were considered in the formation of the alternatives. However, it was determined to focus the description of alternatives on the contract proposals and address issues related to water supply improvements to be addressed by CALFED and the Least Cost Yield study. Consideration of comments on methods to address impacts were considered in the development of the Environmental Consequences section of this EA. However, the impact analysis focused on the comparison of the alternatives with the projected NAA not the Existing Conditions scenario.

Based upon the comments received and the determination to focus the alternatives on the language in the proposed contracts, the level of detail for this EA was determined. It was also determined that based upon the minimal number of differences between Alternatives 1 and 2, an EIS would not be necessary.

CONSULTATION WITH OTHER AGENCIES

This EA was prepared in accordance with the policies and regulations for the following issues. Brief discussions of these issues and how compliance was addressed in this EA is discussed in the previous sections. Work is continuing on each of these requirements. As individual projects are implemented, compliance requirements will be considered.

- C National Environmental Policy Act
- C California Environmental Quality Act
- C Endangered Species Act
- C Fish and Wildlife Coordination Act
- C National Historic Preservation Act
- C Indian Trust Assets
- C Indian Sacred Sites on Federal Land
- C Environmental Justice
- C State, Area-wide, and Local Plan and Program Consistency
- C Floodplain Management
- C Wetlands Protection
- C Wild and Scenic Rivers Act
- C Farmland Protection Policy Act and Farmland Preservation
- C Clean Air Act
- C Safe Drinking Water Act
- C Clean Water Act

National Environmental Policy Act

This EA was prepared pursuant to regulations implementing the National Environmental Policy Act (NEPA) (42 USC 4321 *et seq.*). NEPA provides a commitment that Federal agencies will consider the environmental effects of their actions. This EA provides information regarding the NAA and alternatives, environmental impacts of the alternatives, potential mitigation measures, and adverse environmental impacts that cannot be avoided.

California Environmental Quality Act

Implementation, funding and permitting actions carried out by State and local agencies must comply with the California Environmental Quality Act (CEQA). The CEQA requirements are similar to NEPA requirements. This EA could be used as a basis for preparation of a CEQA document.

Fish and Wildlife Coordination Act

The FWCA requires that Reclamation consult with fish and wildlife agencies (federal and state) on all water development projects that could affect biological resources. The implementation of the CVPIA, of which this action is a part, has been jointly analyzed by Reclamation and the Service and is being jointly implemented. This continuous consultation and consideration of the views of the Service in addition to their review of this document and consideration of their comments satisfies any applicable requirements of the FWCA.

Endangered Species Act

Reclamation is preparing a biological assessment to determine if alternatives will affect listed threatened and endangered species. The biological assessment addresses all species affected by the CVP operation for the Cross Valley Contractors. If the biological assessment indicates that the alternatives may affect a listed species, Reclamation will request formal consultation pursuant to the ESA.

National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that Federal agencies evaluate the effects of Federal undertakings on historical, archeological, and cultural resources and afford the Advisory Council on Historic Preservation opportunities to comment on the proposed undertaking. The first step in the process is to identify cultural resources included on (or eligible for inclusion on) the National Register of Historic Places that are located in or near the project area. The second step is to identify the possible effects of proposed actions. The lead agency must examine whether feasible alternatives exist that would avoid such effects. If an effect cannot reasonably be avoided, measures must be taken to minimize or mitigate potential adverse effects.

During preparation of this EA, information from the State Clearinghouse was collected. The counties within San Felipe Division have initiated separate consultations with respect to their land use planning activities. It was determined by the State Historic Preservation Office that compliance with Section 106 should be coordinated on a project-specific basis.

Indian Trust Assets

The United States Government's trust responsibility for Indian resources requires Reclamation and other agencies to take measures to protect and maintain trust resources. These responsibilities include taking reasonable actions to preserve and restore tribal resources. Indian Trust Assets (ITAs) are legal interests in property and rights held in trust by the United States for Indian tribes or individuals. Indian reservations, rancherias, and allotments are common ITAs.

During preparation of EA, it was determined based upon information provided by Reclamation, that no ITAs exist within the San Felipe Division.

Indian Sacred Sites on Federal Land

Executive Order 13007 provides that in managing Federal lands, each Federal agency with statutory or administrative responsibility for management of Federal lands shall, to the extent practicable and as permitted by law, accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and avoid adversely affecting the physical integrity of such sacred sites. No sacred sites were identified during the scoping or planning process, and therefore were not included in the impact assessment of this EA.

Environmental Justice

Executive Order 12898 requires each Federal agency to achieve environmental justice as part of its mission, by identifying and addressing disproportionately high and adverse human health or environmental effects, including social or economic effects, of programs, policies, and activities on minority populations and low-income populations of the United States. This EA has evaluated the environmental, social, and economic impacts on minority and low-income populations in the impact assessment of alternatives.

State, Area-wide, and Local Plan and Program Consistency

Agencies must consider the consistency of a proposed action with approved state and local plans and laws. This EA was prepared with extensive information from local planning agencies.

Floodplain Management

If a Federal agency program will affect a floodplain, the agency must consider alternatives to avoid adverse effects in the flood plain or to minimize potential harm. Executive Order 11988 requires Federal agencies to evaluate the potential effects of any actions they might take in a floodplain and to ensure that planning, programs, and budget requests reflect consideration of flood hazards and floodplain management. The alternatives would not affect floodplain management as compared to the NAA.

Wetlands Protection

Executive Order 11990 authorizes Federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands when undertaking Federal activities and programs. Any agency considering a proposal that might affect wetlands must evaluate factors affecting wetland quality and survival. These factors should include the proposal's effects on the public health, safety, and welfare due to modifications in water supply and water quality; maintenance of natural ecosystems and conservation of flora and fauna; and other recreational, scientific, and cultural uses. The alternatives would not affect wetlands as compared to the NAA.

Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act designates qualifying free-flowing river segments as wild, scenic, or recreational. The Act establishes requirements applicable to water resource projects affecting wild, scenic, or recreational rivers within the National Wild and Scenic Rivers System, as well as rivers designated on the National Rivers Inventory. Under the Act, a Federal agency may not assist the construction of a water resources project that would have a direct and adverse effect on the free-flowing, scenic, and natural values of a wild or scenic river. If the project would affect the free-flowing characteristics of a designated river or unreasonably diminish the scenic, recreational and fish and wildlife values present in the area, such activities should be undertaken in a manner that would minimize adverse impacts and should be developed in consultation with the National Park Service. None of the EA alternatives would affect flows in wild and scenic portions of rivers.

Farmland Protection Policy Act and Farmland Preservation

Two policies require federal agencies to include assessments of the potential effects of a proposed project on prime and unique farmland. These policies are the Farmland Protection Policy Act of 1981 and the Memoranda on Farmland Preservation, dated August 30, 1976, and August 11, 1980, respectively, from the U.S. Council on Environmental Quality. Under requirements set forth in these policies, federal agencies must determine these effects before taking any action that could result in converting designated prime or unique farmland for nonagricultural purposes. If implementing a project would adversely affect farmland preservation, the agencies must consider alternatives to lessen those effects. Federal agencies also must ensure that their programs, to the extent practicable, are compatible with state, local, and private programs to protect farmland. The SCS is the federal agency responsible for ensuring that these laws and policies are followed. No specific consultation was conducted during preparation of this EA. The alternatives would not affect agricultural or urban lands as compared to the NAA.

Clean Air Act

The Federal Clean Air Act (CAA) was enacted to protect and enhance the nation's air quality in order to promote public health and welfare and the productive capacity of the nation's population. The CAA requires an evaluation of any federal action to determine its potential impact on air quality in the project region. Coordination is required with the appropriate local air quality management district as well as with the EPA. This coordination would determine whether the project conforms to the Federal Implementation Plan and the State Implementation Plan (SIP).

Section 176 of the CAA (42 U.S.C. Section 7506(c)) prohibits federal agencies from engaging in or supporting in any way an action or activity that does not conform to an applicable SIP. Actions and activities must conform to a SIP's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards and in attaining those standards expeditiously. EPA promulgated conformity regulations (codified in 40 CFR Section 93.150 et seq.).

The alternatives assume that current practices to control dust and soil erosion on lands that are seasonally fallowed would continue and the land use agencies would continue to work with the air quality districts.

Therefore, it assumed that no air quality impacts would occur due to the alternatives as compared to the NAA.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) (PL 99-339) became law in 1974 and was reauthorized in 1986 and again in August 1996. Through the SDWA, Congress gave the EPA the authority to set standards for contaminants in drinking water supplies. Amendments to the SDWA provide more flexibility, more state responsibility, and more problem prevention approaches. The law changes the standard-setting procedure for drinking water and establishes a State Revolving Loan Fund to help public water systems improve their facilities and to ensure compliance with drinking water regulations and to support state drinking water program activities.

Under the SDWA provisions, the California Department of Health Services has the primary enforcement responsibility. The California Health and Safety Code establishes this authority and stipulates drinking water quality and monitoring standards. To maintain primacy, a state's drinking water regulations cannot be less stringent than the federal standards. The analysis of the EA alternatives as compared to the SDWA requirements indicated that there were no changes in compliance as compared to the NAA.

Clean Water Act

The Clean Water Act (CWA) gave the EPA the authority to develop a program to make all waters of the United States "fishable and swimmable." This program has included identifying existing and proposed beneficial uses and methods to protect and/or restore those beneficial uses. The CWA contains many provisions, including provisions that regulate the discharge of pollutants into the water bodies. The discharges may be direct flows from point sources, such as an effluent from a wastewater treatment plant, or a non-point source, such as eroded soil particles from a construction site. The analysis of the EA alternatives as compared to the CWA requirements indicated that there were no changes in compliance as compared to the NAA.

SECTION 5

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APPENDIX A

SPECIAL-STATUS SPECIES

APPENDIX A

Special-Status Species of Fresno, Kern, Kings, and Tulare Counties (Valley Floor Portion)

Sensitive species that may occur in or be affected by projects on the valley floor portion of Fresno, Kern, Kings, and Tulare Counties.

Common Name	Scientific Name	Federal Status	State Status
FRESNO COUNTY			
Listed Species			
Plants			
Greene's Orcutt Grass	<i>Tuctoria greenei</i>	E	SC
Hartweg's Golden Sunburst	<i>Pseudobahia bahiifolia</i>	E	E
San Joaquin Adobe Sunburst	<i>Pseudobahia piersonii</i>	T	E
Hoover's Woolly-star	<i>Eriastrum hooveri</i>	T	None
San Joaquin Woollythreads	<i>Lembertia congdonii</i>	E	None
California Jewelflower	<i>Caulanthus californicus</i>	E	E
Palmate-bracted Bird's Beak	<i>Cordylanthus palmatus</i>	E	E
Invertebrates			
Vernal Pool Fairy Shrimp	<i>Branchinecta lynchi</i>	T	SC
Vernal Pool Tadpole Shrimp	<i>Lepidurus packardii</i>	E	SC
Valley Longhorn Elderberry Beetle	<i>Desmocerus californicus dimorphus</i>	T	None
Reptiles			
Blunt-nosed Leopard Lizard	<i>Gambelia silus</i>	E	
Giant Garter Snake	<i>Thamnophis gigas</i>	T	T
Birds			
Bald Eagle	<i>Haliaeetus leucocephalus</i>	FPD	E
Swainson's Hawk	<i>Buteo swainsoni</i>	None	T
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	Delisted	E
Least Bell's Vireo	<i>Vireo bellii pusillus</i>	E	E
Mammals			
Giant Kangaroo Rat	<i>Dipodomys ingens</i>	E	E
Fresno Kangaroo Rat	<i>Dipodomys nitratoideis exilis</i>	E	E
San Joaquin Kit Fox	<i>Vulpes macrotis mutica</i>	E	T
Species of Concern			
Invertebrates			
Hoppings Blister Beetle	<i>Lytta hoppingi</i>	SC	None
Amphibians			
California Tiger Salamander	<i>Ambystoma californiense</i>	FC	SC
Western Spadefoot	<i>Scaphiopus hammondi</i>	None	SC
Reptiles			
Western Pond Turtle	<i>Clemmys marmorata</i>	None	SC
California Horned Lizard	<i>Phrynosoma coronatum frontale</i>	None	SC
California Legless Lizard	<i>Anniella pulchra</i>	None	SC
San Joaquin Coachwhip	<i>Masticophis flagellum ruddocki</i>	None	SC
Birds			
American White Pelican	<i>Pelecanus erythrorhynchos</i>	None	SC
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	None	SC
White-faced Ibis	<i>Plegadis chihi</i>	None	SC

SPECIAL-STATUS SPECIES OF FRESNO, KERN, KINGS, AND TULARE COUNTIES (VALLEY FLOOR PORTION)

Common Name	Scientific Name	Federal Status	State Status
Osprey	<i>Pandion haliaetus</i>	None	SC
Northern Harrier	<i>Circus cyaneus</i>	None	SC
Sharp-shinned hawk	<i>Accipiter striatus</i>	None	SC
Cooper's Hawk	<i>Accipiter cooperii</i>	None	SC
Ferruginous Hawk	<i>Buteo regalis</i>	None	SC
Golden Eagle	<i>Aquila chrysaetos</i>	None	SC
Merlin	<i>Falco columbarius</i>	None	SC
Prairie Falcon	<i>Falco mexicanus</i>	None	SC
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	None	SC
Mountain Plover	<i>Charadrius montanus</i>	FC	SC
Long-billed Curlew	<i>Numenius americanus</i>	None	SC
California Gull	<i>Larus californicus</i>	None	SC
Burrowing Owl	<i>Athene cunicularia</i>	None	SC
Long-eared Owl	<i>Asio otus</i>	None	SC
Short-eared owl	<i>Asio flammeus</i>	None	SC
Loggerhead Shrike	<i>Lanius ludovicianus</i>	None	SC
California Horned Lark	<i>Eremophila alpestris actia</i>	None	SC
Yellow Warbler	<i>Dendroica petechia</i>	None	SC
Yellow-breasted Chat	<i>Icteria virens</i>	None	SC
Tricolored Blackbird	<i>Agelaius tricolor</i>	None	SC
Mammals			
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	None	SC
Pallid Bat	<i>Antrozous pallidus</i>	None	SC
California Mastiff Bat	<i>Eumops perotis californicus</i>	None	SC
Short-nosed kangaroo Rat	<i>Dipodomys nitratoideus brevinasus</i>	None	SC
Tulare Grasshopper Mouse	<i>Onychomys torridus ramona tularensis</i>	None	SC
KERN COUNTY			
Listed Species			
Plants			
San Joaquin Adobe Sunburst	<i>Pseudobahia piersonii</i>	T	E
Hoover's Woolly-star	<i>Eriastrum hooveri</i>	T	None
Bakersfield Cactus	<i>Opuntia treleasei</i>	E	E
San Joaquin woollythreads	<i>Lembertia congdonii</i>	E	None
California Jewelflower	<i>Caulanthus californicus</i>	E	E
Kern Mallow	<i>Eremalche kernensis</i>	E	None
Invertebrates			
Valley Longhorn Elderberry Beetle	<i>Desmocerus californicus dimorphus</i>	T	None
Reptiles			
Blunt-nosed Leopard Lizard	<i>Gambelia silus</i>	E	E
Giant Garter Snake	<i>Thamnophis gigas</i>	T	T
Birds			
California Condor	<i>Gymnogyps californianus</i>	E	E
Swainson's Hawk	<i>Buteo swainsoni</i>	None	T
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	Delisted	E
Least Bell's Vireo	<i>Vireo bellii pusillus</i>	E	E

SPECIAL-STATUS SPECIES OF FRESNO, KERN, KINGS, AND TULARE COUNTIES (VALLEY FLOOR PORTION)

Common Name	Scientific Name	Federal Status	State Status
Mammals			
Giant Kangaroo Rat	<i>Dipodomys ingens</i>	E	E
San Joaquin Kit Fox	<i>Vulpes macrotis mutica</i>	E	T
Species of Concern			
Invertebrates			
Molestan Blister Beetle	<i>Lytta Molesta</i>	SC	None
Amphibians			
California Tiger Salamander	<i>Ambystoma californiense</i>	FC	SC
Western Spadefoot	<i>Scaphiopus hammondi</i>	None	SC
Reptiles			
Western Pond Turtle	<i>Clemmys marmorata</i>	None	SC
California Horned Lizard	<i>Phrynosoma coronatum frontale</i>	None	SC
California Legless Lizard	<i>Anniella pulchra</i>	None	SC
San Joaquin Coachwhip	<i>Masticophis flagellum ruddocki</i>	None	SC
Birds			
American White Pelican	<i>Pelecanus erythrorhynchos</i>	None	SC
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	None	SC
White-faced Ibis	<i>Plegadis chihi</i>	None	SC
Osprey	<i>Pandion haliaetus</i>	None	SC
Northern Harrier	<i>Circus cyaneus</i>	None	SC
Sharp-shinned hawk	<i>Accipiter striatus</i>	None	SC
Cooper's Hawk	<i>Accipiter cooperii</i>	None	SC
Ferruginous Hawk	<i>Buteo regalis</i>	None	SC
Golden Eagle	<i>Aquila chrysaetos</i>	None	SC
Merlin	<i>Falco columbarius</i>	None	SC
Prairie Falcon	<i>Falco mexicanus</i>	None	SC
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	None	SC
Mountain Plover	<i>Charadrius montanus</i>	FC	SC
Long-billed Curlew	<i>Numenius americanus</i>	None	SC
California Gull	<i>Larus californicus</i>	None	SC
Burrowing Owl	<i>Athene cunicularia</i>	None	SC
Long-eared Owl	<i>Asio otus</i>	None	SC
Short-eared Owl	<i>Asio flammeus</i>	None	SC
Loggerhead Shrike	<i>Lanius ludovicianus</i>	None	SC
California Horned Lark	<i>Eremophila alpestris actia</i>	None	SC
Yellow Warbler	<i>Dendroica petechia</i>	None	SC
Yellow-breasted Chat	<i>Icteria virens</i>	None	SC
Tricolored Blackbird	<i>Agelaius tricolor</i>	None	SC
Mammals			
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	None	SC
California Mastiff Bat	<i>Eumops perotis californicus</i>	None	SC
Short-nosed kangaroo Rat	<i>Dipodomys nitratoideus brevinasus</i>	None	SC
Tulare Grasshopper Mouse	<i>Onychomys torridus ramona tularensis</i>	None	SC

SPECIAL-STATUS SPECIES OF FRESNO, KERN, KINGS, AND TULARE COUNTIES (VALLEY FLOOR PORTION)

Common Name	Scientific Name	Federal Status	State Status
KINGS COUNTY			
Listed Species			
Plants			
Hoover's Woolly-star	<i>Eriastrum hooveri</i>	T	None
San Joaquin Woollythreads	<i>Lembertia congdonii</i>	E	None
California Jewelflower	<i>Caulanthus californicus</i>	E	E
Invertebrates			
Valley Longhorn Elderberry Beetle	<i>Desmocerus californicus dimorphus</i>	T	None
Reptiles			
Blunt-nosed Leopard Lizard	<i>Gambelia silus</i>	E	E
Swainson's Hawk	<i>Buteo swainsoni</i>	None	T
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	Delisted	E
Least Bell's Vireo	<i>Vireo bellii pusillus</i>	E	E
Mammals			
Giant Kangaroo Rat	<i>Dipodomys ingens</i>	E	E
Fresno Kangaroo Rat	<i>Dipodomys nitratoideis exilis</i>	E	E
Tipton Kangaroo Rat	<i>Dipodomys nitratoideis nitratoideis</i>	E	E
San Joaquin Kit Fox	<i>Vulpes macrotis mutica</i>	E	T
Species of Concern			
Amphibians			
Western Spadefoot	<i>Scaphiopus hammondi</i>	None	SC
Reptiles			
Western Pond Turtle	<i>Clemmys marmorata</i>	None	SC
California Horned Lizard	<i>Phrynosoma coronatum frontale</i>	None	SC
California Legless Lizard	<i>Anniella pulchra</i>	None	SC
San Joaquin Coachwhip	<i>Masticophis flagellum ruddocki</i>	None	SC
Birds			
American White Pelican	<i>Pelecanus erythrorhynchos</i>	None	SC
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	None	SC
White-faced Ibis	<i>Plegadis chihi</i>	None	SC
Osprey	<i>Pandion haliaetus</i>	None	SC
Northern Harrier	<i>Circus cyaneus</i>	None	SC
Sharp-shinned hawk	<i>Accipiter striatus</i>	None	SC
Cooper's Hawk	<i>Accipiter cooperii</i>	None	SC
Ferruginous Hawk	<i>Buteo regalis</i>	None	SC
Golden Eagle	<i>Aquila chrysaetos</i>	None	SC
Merlin	<i>Falco columbarius</i>	None	SC
Prairie Falcon	<i>Falco mexicanus</i>	None	SC
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	None	SC
Mountain Plover	<i>Charadrius montanus</i>	FC	SC
Long-billed Curlew	<i>Numenius americanus</i>	None	SC
California Gull	<i>Larus californicus</i>	None	SC
Burrowing Owl	<i>Athene cunicularia</i>	None	SC
Long-eared Owl	<i>Asio otus</i>	None	SC
Short-eared owl	<i>Asio flammeus</i>	None	SC

SPECIAL-STATUS SPECIES OF FRESNO, KERN, KINGS, AND TULARE COUNTIES (VALLEY FLOOR PORTION)

Common Name	Scientific Name	Federal Status	State Status
Loggerhead Shrike	<i>Lanius ludovicianus</i>	None	SC
California Horned Lark	<i>Eremophila alpestris actia</i>	None	SC
Yellow Warbler	<i>Dendroica petechia</i>	None	SC
Tricolored Blackbird	<i>Agelaius tricolor</i>	None	SC
Mammals			
Pallid Bat	<i>Antrozous pallidus</i>	None	SC
TULARE COUNTY			
Listed Species			
Plants			
San Joaquin Adobe Sunburst	<i>Pseudobahia piersonii</i>	T	E
Greene's Orcutt Grass	<i>Tuctoria greenei</i>	E	SC
Hoover's Woolly-star	<i>Eriastrum hooveri</i>	T	None
San Joaquin Woollythreads	<i>Lembertia congdonii</i>	E	None
California Jewelflower	<i>Caulanthus californicus</i>	E	E
Hoover's Spurge	<i>Chamaesyce hooveri</i>	T	None
Invertebrates			
Vernal Pool Fairy Shrimp	<i>Branchinecta lynchi</i>	T	SC
Vernal Pool Tadpole Shrimp	<i>Lepidurus packardi</i>	E	SC
Valley Longhorn Elderberry Beetle	<i>Desmocerus californicus dimorphus</i>	E	None
Reptiles			
Blunt-nosed Leopard Lizard	<i>Gambelia silus</i>	E	E
Giant Garter Snake	<i>Thamnophis gigas</i>	E	T
Birds			
California Condor	<i>Gymnogyps californianus</i>	E	E
Bald Eagle	<i>Haliaeetus leucocephalus</i>	FPD	E
Swainson's Hawk	<i>Buteo swainsoni</i>	None	T
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	Delisted	E
Least Bell's Vireo	<i>Vireo bellii pusillus</i>	E	E
Mammals			
Tipton Kangaroo Rat	<i>Dipodomys nitratoideus nitratoideus</i>	E	E
San Joaquin Kit Fox	<i>Vulpes macrotis mutica</i>	E	T
Species of Concern			
Invertebrates			
Hoppings Blister Beetle	<i>Lytta hoppingi</i>	SC	None
Molestan Blister Beetle	<i>Lytta molesta</i>	SC	None
Amphibians			
California Tiger Salamander	<i>Ambystoma californiense</i>	FC	SC
Western Spadefoot	<i>Scaphiopus hammondi</i>	None	SC
Reptiles			
Western Pond Turtle	<i>Clemmys marmorata</i>	None	SC
California Horned Lizard	<i>Phrynosoma coronatum frontale</i>	None	SC
California Legless Lizard	<i>Anniella pulchra</i>	None	SC
San Joaquin Coachwhip	<i>Masticophis flagellum ruddocki</i>	None	SC
Birds			
American White Pelican	<i>Pelecanus erythrorhynchos</i>	None	SC

SPECIAL-STATUS SPECIES OF FRESNO, KERN, KINGS, AND TULARE COUNTIES (VALLEY FLOOR PORTION)

Common Name	Scientific Name	Federal Status	State Status
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	None	SC
White-faced Ibis	<i>Plegadis chihi</i>	None	SC
Osprey	<i>Pandion haliaetus</i>	None	SC
Northern Harrier	<i>Circus cyaneus</i>	None	SC
Cooper's Hawk	<i>Accipiter cooperii</i>	None	SC
Ferruginous Hawk	<i>Buteo regalis</i>	None	SC
Golden Eagle	<i>Aquila chrysaetos</i>	None	SC
Merlin	<i>Falco columbarius</i>	None	SC
Prairie Falcon	<i>Falco mexicanus</i>	None	SC
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	None	SC
Mountain Plover	<i>Charadrius montanus</i>	FC	SC
Long-billed Curlew	<i>Numenius americanus</i>	None	SC
California Gull	<i>Larus californicus</i>	None	SC
Burrowing Owl	<i>Athene cunicularia</i>	None	SC
Long-eared Owl	<i>Asio otus</i>	None	SC
Short-eared owl	<i>Asio flammeus</i>	None	SC
Loggerhead Shrike	<i>Lanius ludovicianus</i>	None	SC
California Horned Lark	<i>Eremophila alpestris actia</i>	None	SC
Yellow Warbler	<i>Dendroica petechia</i>	None	SC
Yellow-breasted Chat	<i>Icteria virens</i>	None	SC
Mammals			
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	None	SC
Pallid Bat	<i>Antrozous pallidus</i>	None	SC
Tulare Grasshopper Mouse	<i>Onychomys torridus ramona tularensis</i>	None	SC

Note:

Federal and California State Status:

- (E) Endangered: Listed as being in danger of extinction.
 (T) Threatened: Listed as likely to become endangered within the foreseeable future.
 (SC) Species of Concern.
 (FC) Federal Candidate Species.
 (FPD) Proposed for Delisting.

APPENDIX B

1991 BIOLOGICAL OPINION SUMMARY

**RECLAMATION COMMITMENTS FOR IMPLEMENTATION OF
CVP INTERIM RENEWAL CONTRACTS BIOLOGICAL OPINION
DATED FEBRUARY 27, 1995**

On February 27, 1995, the Fish and Wildlife Service issued its final Biological Opinion addressing Reclamation's action of the interim renewal of 67 water contracts of the Central Valley Project. This interim renewal of long term contracts was provided for in the Central Valley Project Improvement (CVPIA). The CVPIA disallowed the renewal of any long term contracts prior to the completion of a Programmatic Environmental Impact Statement Act, and any other necessary environmental compliance activities. The interim contracts were provided as a bridge to allow water deliveries to continue during the period between the expiration of existing contracts and completion of the PEIS and other needed environmental compliance activities.

The Interim Contract Biological Opinion was a non-Jeopardy Opinion and included a number of commitments made by Reclamation to address concerns relative to listed species, along with other various requirements of the Opinion itself. One of the requirements of the Opinion was that Reclamation provide an annual report addressing implementation of the various requirements contained in the Opinion, with the first report due by March 31, 1996. Reports have been submitted by Reclamation yearly.

Commitments Made by the Bureau of Reclamation

- 1.(a) Notify Districts Regarding Endangered Species Act Requirements
- 1.(b) Develop information on distribution and habitat of listed, proposed and candidate species.
- 1.(c) Map and distribute information developed in 1.(b) above.
- 1.(d) Monitor land use changes and ongoing activities to ensure project water is not used in a manner that adversely affects listed, proposed or candidate species. Coordinate with the Service on any identified such activities.

- 2 (a) Work with the Service, California Department of Pesticide Regulation and others to develop guidelines and information assessing the effects of pesticides on listed proposed and candidate species.
- 2.(b) Develop and distribute guidance on construction and maintenance activities
- 2.(c) Review water conservation plans prior to implementation
- 2.(d). Amend criteria for water conservation plans

- 3.a) Identify lands critical to listed and proposed species
- 3.b) Identify land and water use activities critically impacting listed and proposed species
- 3.c) Develop and implement critical need plan

4. Develop a long-term program to address overall effects of the CVP and Implementation of the CVPIA.

SERVICE REPORTING REQUIREMENTS

1. Meet with the FWS at least quarterly.
2. Provide annual reports to the FWS providing information on various activities as presented in the following sections:
 - (a) Implementation progress of Biological Opinions that have addressed service area effects of the CVP
 - (b) Deliveries provided via Interim Contract relative to historic amounts.
 - (c) Description of all Reclamation actions undertaken by Reclamation that had no effect.
3. Require districts to report take of listed species.
4. Meet with the FWS if incidental take is exceeded.

1991 FRIANT BIOLOGICAL OPINION FOR RENEWAL OF LONG TERM WATER SERVICE CONTRACTS

BACKGROUND OF 1991 ACTION: The Friant Division requested a formal consultation with the Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973, as amended, as part of renewal of 28 long-term water service contracts. Reclamation committed to initiating consultation on other aspects of the CVP so that the interrelated and interdependent impacts, and cumulative effects on species outside the San Joaquin Valley could be fully addressed. With that in mind, the Service issued its Biological Opinion on October 15, 1991, and Amendment of the Biological Opinion on May 14, 1992. In their Opinion, the Service stated that the renewal of the 28 long-term water service contracts would not likely jeopardize the continued existence of fifteen threatened and endangered species found within the Friant Division service area, provided Reclamation institute short- and long-term endangered species conservation programs to mitigate the adverse impacts of continued water delivery to the Friant Division. This program also committed the Service to participate by providing technical assistance and developing revised recovery plans for the San Joaquin Valley species needed for the timely resolution of listed species concerns. To accomplish the goals of providing technical assistance and writing revised recovery plans, Service established an Endangered Species Recovery Program (ESRP) with BOR funding. The core team to cooperatively address implementation of the Friant Biological Opinion consisted of a member from ESRP, BOR and Service. Other individuals were consulted by the team on an as-needed basis, including species experts, other technical experts and agency representatives.

RECLAMATION'S COMMITMENT: The primary focus is the development and implementation of a long-term program that will identify a comprehensive approach to recovery of all listed species with a Federal nexus to Reclamation throughout the San Joaquin Valley. The program is being developed and implemented by Service and Reclamation, and other Federal, state, and local agencies whose activities have or are affecting listed species. State, Federal, and private actions that adversely affect listed species can be mitigated by contributing to the long-term comprehensive program.

Because development of a long-term program would take several years to fully implement, Reclamation implemented an interim program to protect listed species within the Friant service area. This short-term program was intended to be in effect until components of the long-term conservation program could be developed and implemented. The short-term program had the following components:

1. Reclamation immediately issued notices to all Friant contractors regarding the imperative of protecting all remaining habitat of listed species in the Friant Service area.
2. Reclamation, with assistance from ESRP, initiated a comprehensive biological survey of all lands in the Friant service area to ascertain the distribution of all remaining habitat of listed species, and upon full implementation will notify all contractors of the location of wild lands suitable for listed wildlife species.

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3. Reclamation, in coordination with Service and ESRP, provided funds to develop and implement a critical needs plan to identify and secure those habitats requiring immediate protection throughout the Friant service area and also the remainder of the San Joaquin Valley that are vulnerable to agricultural conversion. This information was incorporated into the *Recovery Plan for Upland Species of the San Joaquin Valley, California* which was developed by Service with significant contributions by ESRP and BOR. The Recovery Plan was finalized by the Service on September 9, 1998.
4. Reclamation implemented a plan to prevent take associated with operations and maintenance of Friant Division facilities, and pest control activities by farmers receiving Federal water.
5. Reclamation has consulted with the Service on (a) any requested inclusions or exclusions from the Friant service area, (b) any water contracts involving Friant facilities other than the 28 long-term contracts subject to review in this biological opinion, and (c) any deliveries of water using Friant facilities beyond that addressed in this biological opinion.
6. Reclamation is implementing a long-term plan to prevent/minimize take and contribute to the survival of listed species throughout the San Joaquin Valley.

FULFILMENT OF THE COMMITMENTS UNDER THE FRIANT BIOLOGICAL OPINION:

On November 15, 1991 a letter was sent to contractors regarding the imperative of protecting all remaining habitat of listed species in the Friant Service area.

To base information upon up-to-date land use, Reclamation contracted to fly the San Joaquin Valley for the purpose of taking photographs at a scale of 1:24,000. These photographs became available October 12, 1992. Photographs were analyzed to determine existing potential habitat for endangered species. Reclamation concentrated efforts in the Friant Division and in lands historically occupied by critically endangered species.

In 1993 letters requesting access to private properties for the purpose of conducting wildlife surveys on potential habitat were sent to land owners both within the Friant Service area and outside the service area. This effort created considerable controversy and became a news item on network television and national magazines. Public workshops were held to discuss the surveys. Despite the level of controversy, access was granted for approximately thirty-five thousand acres of land (the Friant Division Service Area is about one million acres). Access was provided by the landowner signing and returning a form to Reclamation giving permission to enter onto their property to survey for plants and/or animals. If the form was not signed and returned, no surveys were conducted. Of the thirty-five thousand acres, only about 75% (26,355 acres) of this land was actually habitat. Drive by surveys were conducted in mid-December, 1993 and subsequently arrangements were made with the owners to survey individual parcels.

Most of the properties surveyed held no listed species, and were found to be too densely vegetated to allow colonization by any listed species, either plants or animals. Three parcels held populations of

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Tipton kangaroo rat, *Dipodomys nitratooides*, while several others held populations of the more common kangaroo rat, *D. heermanni*. Blunt-nosed leopard lizards (*Gambelia sila*) were found on only one parcel. Vernal pool fairy shrimp *Branchinecta lynchi* were found in pools on one parcel. Plants found include adobe golden sunburst, *Pseudobahia peirsonii*; Bakersfield cactus, *Opuntia basilaris*; and palmate-bracted bird's beak, *Cordylanthus palmatus*. The Bakersfield cactus was on a property area that although in private ownership, the owners intend to protect the plants.

Subsequent Reclamation efforts have covered Reclamation lands in the Friant Division and in other water service areas. There have also been significant cost-shared efforts with other entities to survey other publicly owned lands. Additional information on surveys are provided under *Notable Accomplishments* below.

A draft critical needs plan to identify and secure those habitats requiring immediate protection throughout the Friant service area and also the remainder of the San Joaquin Valley was developed cooperatively by Service and ESRP. That information was incorporated into the *Recovery Plan for Upland Species of the San Joaquin Valley, California* in September 9, 1998 following several years of gathering existing and new data by ESRP.

Reclamation implemented an interim plan to prevent take associated with operations and maintenance of Friant Division, and, in cooperation with the water authorities, is continuing to revise the operations and maintenance documents that constitute the O&M Plan. The documents consist of an *Operations and Maintenance Plan: Field Manual*, and an *Operations and Maintenance Plan: Endangered, Threatened and Sensitive Species*, intended for use in the field by Reclamation or contract staff as a guide to be used as a reference when conducting or planning operations and maintenance activities. The *Operations and Maintenance Plan: Overview*, is intended to be used by managers and planners. Friant Water User's Authority is developing an Integrated Pest Management Plan that will be used with the O&M Plan. A booklet of sensitive, threatened and endangered information, including photographs has been created to be used in training for staff and as a reference. Reclamation is also working with the Department of Pesticide Regulation to minimize T&E impacts from pesticide application.

Reclamation has consulted with the Service on (a) any requested inclusions or exclusions from the Friant service area, (b) any water contracts involving Friant facilities other than the 28 long-term contracts subject to review in this biological opinion, and (c) any deliveries of water using Friant facilities beyond that addressed in this biological opinion. To avoid the need to repeatedly consult on each action Reclamation and Service are working to develop guidelines and/or seek approval for the same action over a multi-year time period.

Reclamation is implementing a long-term plan to prevent/minimize take and contribute to the survival of listed species throughout the San Joaquin Valley. Reclamation and the Service are providing an ecosystem-based approach to the recovery of listed species in the San Joaquin Valley. The program is

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one which allows other agencies to contribute efforts or funds to mitigate adverse effects of projects or programs on listed species in the San Joaquin Valley. Reclamation is implementing, as a component of a broader program, items identified in the recovery plan that are Reclamation's responsibility.

Geographic Information Systems (GIS) maps showing such features as: land use, potential habitat, and present species locations is being created by Reclamation. Some information is incomplete and it is anticipated that it may take several more years to complete the GIS maps. This information is being shared with responsible entities who have joined Reclamation and the Service's cooperative effort toward preserving endangered species in the San Joaquin Valley.

These and other aspects of the program should allow more wise future land management decisions to be made for mitigation purposes.

With full implementation of actions committed to by Reclamation under the 1991 Friant Biological Opinion, continued deliveries of water for the Friant Division will continue to fulfill project purposes, while avoiding adverse impact to threatened and endangered species.

STATUS:

BOR completed many of the commitments and has significantly contributed to the protection and recovery of a number of T&E species (see attached Friant Biological Opinion Implementation Schedule for tasks, completion dates and status information). Cost sharing and cooperation with other agencies has been significant. In a letter to Reclamation dated February 27, 1998 Service stated that the ongoing efforts by BOR continues to be satisfactory.

It should be noted that the terms and conditions to avoid jeopardy were somewhat different for the Friant Biological Opinion than for the Biological Opinion for Interim Renewal of Water Service Contracts (1995) (Interim BO). Delta and Cross Valley Canal water users had most of the San Joaquin Valley species that were referred to in the Friant Biological Opinion. Reclamation therefore committed to not only implementing the Interim Biological Opinion for the interim water districts, but also included some of the short and long-term measures that were in the Friant Biological Opinion, where applicable. This provided for consistency and addressed issues that were not limited to the Friant Division. A specific example is the evaluation of Reclamation lands to develop a wildlife corridor. Animals such as the San Joaquin kit fox need to travel from one area of habitat to another to assure that populations will not become isolated and subject to genetic problems. This issue is specifically mentioned in the Friant Biological Opinion. Reclamation is evaluating its rights-of-way not only in Friant Division but also in the San Luis and Delta areas within the San Joaquin Valley to determine if the lands can be used as a wildlife corridor without causing problems with operations and maintenance of the facilities and if there is a value or need in a particular area to use the right-of-way as a corridor. Prior to implementation of

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any measures we coordinate with Service, California Department of Fish and Game, and the water authorities to be sure all are in agreement and that no unforeseen problems will occur.

NOTABLE ACCOMPLISHMENTS:

Recovery Plan for Upland Species of the San Joaquin Valley, California

- The Recovery Plan was written by ESRP with funding from BOR . The draft document was provided to FWS and with editing became their document for official release. Many of the species with which BOR has to deal had little or incomplete information available about them. ESRP, through surveys and specific research and monitoring studies, were able to provide valuable information in the Recovery Plan that will be crucial to ongoing efforts by everyone living or doing business in the San Joaquin Valley. Service has indicated that the multi-species recovery plan is being used as a model by others who are writing recovery plans (Pers. Communication, Cay Goude, USFWS).

Biological Surveys Leading to Land Protection

- Keck's checkerbloom (*Sidalcea keckii*): A commitment to survey Reclamation owned and withdrawn lands led to the discovery in 1998 of a rare plant, Keck's checkerbloom. Only known from 2 locations in the world and thought to be extinct for 65 years it was rediscovered near Porterville on private land. Reclamation was not involved in the discovery near Porterville but because land withheld to Reclamation was in the vicinity of the second population, it was decided to conduct biological surveys of the land following a multi-year drought. The second population was rediscovered during the year of el nino rainfall. The Sierra Foothill Conservancy, using Central Valley Project Conservation Program funding has secured additional lands and is seeking additional funds to create a preserve of reasonable size to assure protection for the plant. Land was protected by a combination of acquisition and conservation easement.
- Palmate-bracted bird's beak (*Cordylanthus palmatus*) The second largest population of palmate-bracted birds' beak (endangered plant) in the San Joaquin Valley was discovered during biological surveys on private land with the landowner's written permission. The land also includes the endangered blunt-nosed leopard lizard (*Gambelia silas*) and the San Joaquin kit fox (*Vulpes macrotis mutica*) Efforts to protect the site are now being explored by land conservation organizations and the landowner.

Wildlife Corridors

- San Joaquin Kit Fox (*Vulpes macrotis mutica*): Reclamation canals may act as a linear barrier in the passage of wildlife, but the rights-of-way can also be used as a pathway through urban and agricultural lands. Reclamation has committed to assess the feasibility of enhancing the passage of wildlife where possible and where it will not interfere with facility operations. ESRP has acquired valuable biological data on the use of rights-of-way and agricultural lands by San Joaquin kit foxes and their interaction with red foxes. Reclamation and the water authorities are installing escape dens to facilitate passage of kit foxes by providing a safe refuge from predators. We are partnering with Caltrans, DWR, DFG, and FWS. Projects are being evaluated on the Friant-Kern Canal, on Reclamation's right-of-way in the city of Bakersfield, and in the Santa Nella area.

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Address Potential Effects to T&E Species From O&M Activities and Pesticide Use

- Avoidance measures were developed and are being implemented on Reclamation lands to avoid harm to T&E species. The education of applicators and advisors about the dangers of pesticide use on T&E species was not being adequately provided. Reclamation partnered with Department of Pesticide Regulations (DPR) to provide education to applicators and advisors, including the creation of an educational packet on threatened and endangered species. Education and/or training has to be acquired prior to re-certification of applicators and advisors. That training now includes information specifically on the avoidance of threatened and endangered species.

Partnering/Cost Sharing to Lower Costs and Maximize Effort

- Madera Equalizing Reservoir: Partnering with Caltrans on a vernal pool project resulted in learning new methods to enhance vernal pools with an added benefit that we were able to fence and protect the Madera Equalizing Reservoir to better manage the riparian vegetation and wildlife. It is a documented foraging area for bald eagles and has a population of two species of endangered orcutt grass . Caltrans provided funding for the project, including a land survey of the property. The fencing project was paid for from still another funding source, and Fresno State partnered to provide a survey of riparian vegetation at no cost to Reclamation. A small Reclamation grant to Fresno State to purchase supplies and materials led to still more habitat improvement to the equalizing reservoir. Fish and Game has tracked radio collared bald eagles to the Madera Equalizing reservoir from larger area reservoirs during noisy weekends (no cost to Reclamation). Fresno State is interested in using the area as an outdoor habitat study area. Less than \$10,000 of Reclamation SCC O&M funds have been spent on a project whose total costs are several hundred thousand dollars, counting the land survey. The water district has stated that no adverse impacts to O&M operations has occurred. The knowledge gained benefits wildlife management agencies, the wildlife itself, and has saved funding by avoiding duplication of effort by individual agencies.

Critical Needs Species

- Reclamation anticipated the most critically endangered species in the valley would be the Fresno kangaroo rat, Dipodomys nitratoide nitratoide whose habitat was largely destroyed through agricultural development. Surveys so far have not shown any populations to still be in existence. Surveys are continuing and Reclamation will assist in the recovery of the species if any are found.
- The most critically endangered species other than the Fresno kangaroo rat is the riparian brush rabbit, Sylvilagus bachmani riparius.. Its habitat was along the major rivers including the San Joaquin. It was most recently known from only one population at Caswell Memorial State Park. We are partnering with the State Park, the Folsom BOR office, and the CVPCP to address the protection of the brush rabbit at Caswell. We are also conducting additional surveys to try to locate additional populations and are partnering with the Corps of Engineers to survey Corps fee title lands and flood easements along the Stanislaus River and at other locations.
- Biological surveys have led to the discovery of a second population of the riparian brush rabbit, A large multi-agency effort to initiate captive breeding for the brush rabbit is underway. The Service and State of California Fish and Game are leads, since it is both a Federal and State listed species. Reclamation will be an active participant in the process.

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COURT FINDINGS AND ACTIONS:

- C May 30, 1995, Judge Lawrence K. Karlton found a procedural violation of ESA by BOR in executing the contracts.
- C February 27, 1995, Service issued a biological opinion on the interim Water Contract Renewals (Interim Renewals Opinion - for districts other than Friant)
- C On January 16, 1997, the Federal District Court for the Eastern District of California found the 14 contracts to be invalid. The court stayed its order voiding the contracts until a ruling could be made by an appeal.
- C January 20, 1998 Service and BOR re-initiated formal consultation to the Supplemental Interim Renewal of Central Valley Project Water Contracts to include the 14 Friant Water Contracts, as amended January 20, 1998.
- C February 27, 1998, Service issued an amendment to the 1995 Interim Renewals Opinion to include interim contract renewals for the 14 Friant water districts bringing the total number of districts covered under the Opinion to 68.
- C The amendment adopts the reasonable and prudent measures of the Friant Opinion.

FRIANT BIOLOGICAL OPINION IMPLEMENTATION SCHEDULE

Friant Service Area

<u>Task</u>	<u>Assignment</u>	<u>Completion</u> <u>Date</u>	<u>Status</u>
a. Notice to Contractors	¹ MP	11/15/91	Completed
b. Amend renewed water service contracts to reflect new terms per Article 14.c. after EIS is complete (except Orange Cove I.D.)	¹ MP	² After EIS	² no longer applies
c. Interim Operations & Maintenance plan for Reclamation owned lands in Friant Division to minimize take from operations and maintenance activities			
1. Draft Operations & Maint. plan	¹ SCCAO, MP FWS	1/15/92	updated 11/97 IPM plans in process
2. Develop best management practices for privately owned lands receiving USBR water designed to avoid take from pesticide practices and erosion control measures	¹ SCCAO, MP FWS	10/30/97 working with State Dept Pest Reg	final draft 11/97 Authorities working on IPM Plans; 3 drafts done
3. Final Operations & Maintenance Plan	¹ SCCAO,MP FWS	2/28/93	11/97 draft will be incorporated into Water district IPM Plans

¹ = lead; MP = Mid-Pacific Regional Office; SCCAO = South-Central California Area Office; FWS - Fish and Wildlife Service

² Through subsequent court action contracts were declared invalid. FWS included Friant 14 in Interim Biological Opinion through an amendment

FRIANT BIOLOGICAL OPINION IMPLEMENTATION SCHEDULE

2

Friant Service Area

<u>Task</u>	<u>Assignment</u>	<u>Completion Date</u>	<u>Status</u>
4. Begin implementation of Interim Operations & Maintenance Plan (full implementation combined with Long-Term Conservation Plan, see item e)	¹ SCCAO, MP	2/28/93	Implementation has begun
d. Identify lands in Friant Division service area that provide habitat for listed species (pg 42, #2)			
1. Identify habitat types to be shown on maps and necessary scale	¹ FWS, SCCAO, MP	10/15/93	Habitat types for aerial mapping completed; more detailed mapping begun in 1999
2. Acquire existing aerial photos with date close to 1/1/91 to determine losses after 1/1/91 ³	¹ SCCAO	11/15/92	Completed
3. Acquire new Friant Service Area aerial photography for comparison with 1/1/91 ³ (coordinate with aerials for San Joaquin Valley, item b. for long term plan)	¹ SCCAO	10/30/92	Completed (New photos taken 10/12/92)
4. Delineate habitat types on maps (draw lines on maps)	¹ FWS, ¹ MP ¹ SCCAO	10/30/97	Developed by FWS and RPP. In Recov.Plan

¹ lead; MP = Mid-Pacific Regional Office; SCCAO = South-Central California Area Office; FWS - Fish and Wildlife Service

³ Per agreement between BOR and FWS, date of photos was to be 1/1/91. However, closest date for photos available was 4/12/90

FRIANT BIOLOGICAL OPINION IMPLEMENTATION SCHEDULE

3

Friant Service Area

<u>Task</u>	<u>Assignment</u>	<u>Completion Date</u>	<u>Status</u>
5. Provide aerial photographs to FWS for determination of habitat for listed species	¹ SCCAO(task done by ESRP in Fresno)	6/15/93	Completed
6. FWS ground truth areas providing habitat for listed species w/ possible walk-over surveys, w/out sampling to positively determine species present	¹ FWS(task done by ESRP)	9/15/94	Complete
7. Document habitat losses between 1/1/91 and 10/12/92 based on comparison of aerials ³	¹ SCCAO, ¹ FWS ¹ MP(task done by ESRP,SCCAO)	9/30/95	Complete
8. Input information into GIS system to assist with implementation of longterm wildlife conservation plan.	¹ MP	ongoing	Refining data to develop wildlife corridors/monitor Enhancement projects
9. Begin creating GIS maps showing endangered species habitat areas	¹ FWS, ¹ MP	ongoing	Madera. Canal, FKC,. DMC ROW's digitized
10. Develop program to replace habitat lost between 1/1/91 and 10/12/92 ³	¹ SCCAO, FWS	10/30/97	Draft Mitigation Plan completed

¹= lead; MP = Mid-Pacific Regional Office; SCCAO = South-Central California Area Office; FWS - Fish and Wildlife Service

³ Per agreement between BOR and FWS, date of photos was to be 1/1/91. However, closest date for photos available was 4/12/90

FRIANT BIOLOGICAL OPINION IMPLEMENTATION SCHEDULE

4

11. Implement program to replace habitat lost between 1/1/91 and 10/12/92 ³	¹ SCCAO, MP SCCAO/FWS	2001 ongoing	discussions with FWS in process
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Friant Service Area

<u>Task</u>	<u>Assignment</u>	<u>Completion Date</u>	<u>Status</u>
12. Develop compensation and mitigation plan for future adverse effects on listed species in Friant Service Area	¹ FWS, ¹ SCCAO	10/30/97	Draft Mitigation Plan completed
13. Distribute habitat maps and best management practices to contractors (More detailed maps in process 1999)	¹ MP, FWS	10/30/97	Maps in T&E & Spec of Concern Manual avail 12/97 Mgmt prac. In O&M Manual avail 11/97
e. Critical needs plan - Friant Division service area			
1. Identify species having critical needs	¹ FWS, SCCAO	9/30/94	Complete
2. Identify habitat for listed species requiring <u>immediate</u> protective actions	¹ FWS, SCCAO MP	10/30/94	Incorporated into Recovery Plan by FWS
3. Finalize mapping for listed species habitat requiring <u>immediate</u> protection	¹ FWS, SCCAO MP	10/30/94	Incorporated into Recovery Plan
4. Determine need for acquisition of listed species habitat & make recommendations as appropriate	¹ SCCAO	10/30/94	Incorporated into Recovery Plan
f. Long-Term Conservation Plan	¹ SCCAO, ¹ FWS	Begin FY 95 Due 2001	Similar to CVP Conservation Plan May combine

¹ lead; MP = Mid-Pacific Regional Office; SCCAO = South-Central California Area Office; FWS - Fish and Wildlife Service

FRIANT BIOLOGICAL OPINION IMPLEMENTATION SCHEDULE

5

Long Term Plan for San Joaquin Valley outside the Friant Service Area

<u>Task</u>	<u>Assignment</u>	<u>Completion Date</u>	<u>Status</u>
a. Develop a Cooperative Agreement to include other entities and agencies whose activities affect listed species in the San Joaquin Valley	¹ FWS, ¹ SCCAO	8/15/94	Many cooperative efforts have been implemented
b. Acquire new set of aerial photographs of remainder of San Joaquin Valley (coordinate with aerials acquired for Friant Service Area item d.3.)	¹ MP	10/12/92	Completed.
c. Develop and implement a critical needs plan (in conjunction with the critical needs plan for Friant Service Area)			
1. Identify species having critical needs	¹ FWS, SCCAO	9/30/94	Completed
2. Identify habitat requiring <u>immediate</u> protection	¹ FWS, SCCAO MP	4/30/94	Thought to be Fresno kangaroo rat. Possibly Extinct; still looking
3. Finalize mapping of listed species habitat requiring <u>immediate</u> protection	¹ FWS, SCCAO MP	10/30/94	Recovery Plan finalized FY '98
4. Determine need for acquisition of listed species habitat and make recommendations as appropriate	¹ FWS, SCCAO	8/30/95	Draft of Recovery Plan sent to FWS; out to pub review 12/97.Final FY '98
d. Conduct a Population Viability Analysis for selected species	¹ FWS, SCCAO	9/30/95	In Recovery Plan

¹ lead; MP = Mid-Pacific Regional Office; SCCAO = South-Central California Area Office; FWS - Fish and Wildlife Service

FRIANT BIOLOGICAL OPINION IMPLEMENTATION SCHEDULE

6

Long Term Plan for San Joaquin Valley outside the Friant Service Area

<u>Task</u>	<u>Assignment</u>	<u>Completion Date</u>	<u>Status</u>
e. Develop a comprehensive Recovery Plan for listed species in the San Joaquin Valley	¹ FWS, SCCAO & others	6/30/95	Finalized FY '98
f. Implementation of Reclamation's component of the comprehensive recovery plan	¹ SCCAO et.al.	Implementation underway.	

Full Implementation of Reclamation commitments is scheduled for FY 2001

¹ lead; MP = Mid-Pacific Regional Office; SCCAO = South-Central California Area Office; FWS - Fish and Wildlife Service

APPENDIX C

ECONOMIC ANALYSIS OF NOVEMBER 1999

Economic Analysis of November 1999 Tiered Pricing Proposal for PEIS Preferred Alternative**Date: October 2, 2000**

This submittal presents the results of an Economic Analysis of the application to the PEIS Preferred Alternative of the November 1999 unit rates for CVP water and Tiered Pricing Proposal.

The PEIS Preferred Alternative included assumptions for the tiered pricing of CVP water that were developed during the preparation of the Draft PEIS. Subsequent to completion of the Final PEIS, a different tiered pricing proposal was developed. In addition, the PEIS assumed 1992 CVP water rates. This analysis includes the 1999 water rates. This submittal applies the new water rates and the November 1999 proposal to the Preferred Alternative and compares the results to the impact analysis of the PEIS Preferred Alternative. The level of detail presented in this submittal is consistent with the level of detail presented in the main PEIS document and the technical appendices. Tables are presented in the same format as used in the PEIS.

The economic analysis includes an evaluation of agricultural economics using Central Valley Production Model (CVPM), municipal and industrial water use economics for CVP water using the spreadsheet presented with the PEIS, and regional economics using IMPLAN. This memorandum discusses the new assumptions in the November 1999 proposal. However, this memorandum does not discuss the basic assumptions used in the PEIS models and analytical tools. This memorandum must be used in conjunction with the Draft PEIS and Final PEIS, including the methodology and modeling technical appendices, to explain the overall assumptions for evaluating the Preferred Alternative in the PEIS.

For the Agricultural Land Use and Economics analysis, the methodology used for applying CVP water rates was modified to allow for the new tiered pricing and the use of blended rates to determine a total water rate for all CVP water applied by an irrigation district or agency. These changes result in changes in water use due to the affordability of CVP water supplies, not a change in reliability.

For the Municipal and Industrial Water Use Economics analysis, blended rates had been used in the PEIS analysis. In addition, this analysis assumes that the municipal and industrial users will be able to afford the calculated water costs, as described in the PEIS. Therefore, CVP water deliveries do not change for the municipal and industrial analysis. The Regional Economics analysis reflects only changes to agricultural and municipal and industrial sectors, but not recreation sectors.

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SECTION 1

AGRICULTURAL LAND USE AND ECONOMICS

AGRICULTURAL LAND USE AND ECONOMICS

CONTRACT RENEWAL PROPOSAL WITH BLENDED WATER RATES

In the November 1999 proposal, Reclamation has proposed that water sold to CVP water service contractors be sold according to tiered water rates as required by CVPIA section 3404.

Reclamation has also proposed that two categories of water be identified. Category 1 water would be calculated as the average delivery of the previous five years, and would be split into three tiers according to the 80-10-10 quantities defined in the CVPIA. Category 2 water would be any water available in excess of the 5-year rolling average, up to the total contract amount as defined by the Needs Analysis.

Tier 1 water rates include the cost-of-service component and any applicable Restoration charges and surcharges. Both the Restoration Charge and the capital component of the cost-of-service rate are subject to ability-to-pay limits. These limits are in effect for Bella Vista WD and Clear Creek CSD, contractors on the Corning and Tehama-Colusa Canals, and contractors receiving water from New Melones.

Tier 3 water rates include the full-cost rate (as defined in the Reclamation Reform Act) and any applicable Restoration Charges. No ability-to-pay relief is provided in this Tier. The Tier 2 water rate is the average of the applicable Tier 1 and Tier 3 rates. Category 2 water has the same rate as Tier 3.

For this proposal, it is assumed that water conservation guidelines allow contractors to blend the rate of CVP water delivered in any tier or Category, and that they do blend the rates. This is different from the assumption used to assess alternatives in the PEIS, in which contractors were assumed to sell CVP water to growers at tiered rates. Differences between PEIS pricing assumptions and this analysis are:

- This analysis assumes that contractors blend the price of all CVP water received at tiered rates into a single rate. Tiered rates to growers are assumed in the PEIS.
- The project water portion of Sacramento River water rights settlement contracts are not subject to the new pricing policy in this analysis. In the PEIS it was assumed that it was subject to tiered rates.
- Rates are based on the Irrigation Water Rates spreadsheets provided by Reclamation in November 1999. PEIS rates used the 1994 Irrigation Water Rates manual.
- Ability-to-pay relief is incorporated using the current payment capacity studies for Shasta County irrigation contractors, Corning Canal contractors, Tehama Colusa Canal contractors, and New Melones contractors. In the PEIS, payment capacity was based on a 1992 regional study (PEIS, 1999).

AGRICULTURAL LAND USE AND ECONOMICS

- In this analysis, ability to pay relief is provided in Tier 1, with none in Tier 3 - Tier 2 is the average of Tiers 1 and 3, and so provides 50% relief. In the PEIS, the same dollar amount of ability to pay relief is applied in all pricing tiers.
- A \$7.00 per acre-foot Restoration Charge is assumed in this analysis. A \$6.50 per acre-foot charge was used in the PEIS. The Friant surcharge was \$7.00 per acre-foot in both studies.
- There is no lower bound on the usage of CVP water. In the PEIS each subregion was restricted to using at least the Tier 1 quantity of CVP supplies.

METHODOLOGY

Other than the differences listed above, the modeling approach and underlying data were the same as used for the PEIS. The Central Valley Production Model (CVPM) was used in this analysis, with modifications needed to assess the specific water pricing conditions proposed. Table 1 shows the regions of the CVPM and the corresponding service areas. Groundwater hydrology was not assessed as it was in the PEIS alternatives. Therefore, for purposes of analysis, most regions were assumed to have access to replacement groundwater if needed. Based on groundwater hydrology as described in the PEIS, the following subregions are assumed to be unable to replace any CVP water with groundwater on a long term basis: Shasta County irrigation contractors (subregion 1), Corning Canal contractors (subregion 2), and the Tehama-Colusa service area (subregion 3B).

Water deliveries from the CVPIA Preferred Alternative were used (Reclamation CVPIA PEIS, 1999). These deliveries were allocated on a yearly basis into pricing tiers and categories according to the rules described above. Weighted average (i.e., blended) prices were calculated for each year, with quantities in each tier and category based on the previous five years of delivery. In any given year, the quantity and blended price of water depends on the 6-year sequence leading up to and including the current year. Throughout this report the following conventions are used: an Average year represents the average 1922-1990 water delivery from the CVPIA Preferred Alternative (Reclamation CVPIA PEIS, 1999); a Wet year represents the average delivery for the period of 1967-1971 from the CVPIA Preferred Alternative; and a Dry year is the average 1928-1934 delivery from The CVPIA Preferred Alternative.

AGRICULTURAL LAND USE AND ECONOMICS

A total of nine water supply sequences are assessed in this analysis and compared to the CVPIA Preferred Alternative:

Average-Average:	An average water year following a 5-year sequence of average years.
Wet-Average:	An average water year following a 5-year sequence of wet years.
Dry-Average:	An average water year following a 5-year sequence of dry years.
Average-Wet:	A wet water year following a 5-year sequence of average years.
Wet-Wet:	A wet water year following a 5-year sequence of wet years.
Dry-Wet:	A wet water year following a 5-year sequence of dry years.
Average-Dry:	A dry water year following a 5-year sequence of average years.
Wet-Dry:	A dry water year following a 5-year sequence of wet years.
Dry-Dry:	A dry water year following a 5-year sequence of dry years.

The CVP water rates used for each of the nine sequences described above and the CVPIA Preferred Alternative tiered prices are shown in Table 3. Tables 4-12 show the available CVP water service contract supplies by tier and the blended price for each of the 22 subregions under the nine sequences proposed for the Long-Term Contract Renewal analysis.

Results are shown for each of the nine sequences presented as differences compared to the CVPIA Preferred Alternative. When calculating differences from the CVPIA Preferred Alternative, sequences ending in an Average, Wet and Dry years are compared to the Average, Wet and Dry year CVPIA Preferred Alternative results respectively.

IRRIGATED ACRES

Changes in irrigated acres from the Preferred Alternative are summarized by region in Table 13. A complete list of changes by crop and subregion is provided as Table 17.

Both the Average-Average and Wet-Average scenarios show little difference from the Preferred Alternative under the Average hydrology conditions. The Dry-Average sequence shows a larger reduction in irrigated acres almost all of which comes from the Sacramento River region. Compared to the Wet year Preferred Alternative results, there is a similar pattern for the three Long-Term Contract Renewal sequences ending with Wet years. For all three of the Long Term Contract Renewal Sequences ending in a dry year there minimal increases in irrigated acreage compared to the Dry year CPVIA Preferred Alternative results. Irrigated acres remain unchanged under all nine sequences in the San Felipe Division.

AGRICULTURAL LAND USE AND ECONOMICS

The reduction in acreage in Average and Wet years preceded by a series of Dry years is a result of higher CVP water costs. Since the quantity of Category 1 water is based on the average deliveries of the preceding five years, the quantity of water eligible for Category 1 classification shrinks when a sustained drought is experienced. In an average or wet year follows a drought period, water becomes available however a large portion is classified as Category 2 and is priced at the full cost rate. This can be seen in Tables 6 and 9. When this relatively large block of full cost water is incorporated into the blended water price, all CVP supplies become more expensive, and sometimes unaffordable. This result is not seen in the dry-dry sequence because there is not excess water that gets classified as Category 2.

GROSS AND NET REVENUE

Gross revenue (value of production) impacts follow acreage impacts quite closely, and are shown by region in Table 14. Compared to the Average Preferred Alternative, a small reduction of less than \$1 million is estimated for the Average-Average and Wet-Average scenarios, and a \$39 million reduction is estimated in Dry-Average scenario. Gross revenue also declines compared to the Wet Preferred Alternative with approximately \$5 million reductions in Average and Wet years and a larger reduction of \$29 million in the Dry-Wet scenario. In dry years preceded by all three hydrologic conditions, gross revenue is slightly higher when compared to the Preferred Alternative Dry year results. There were no changes in gross revenue for the San Felipe Division since there were no changes in irrigated acres compared to the CVPIA preferred Alternative. A complete list of changes in gross revenue by crop and subregion is provided as Table 18.

Net revenue impacts are separated into five components; Fallowed land, Groundwater pumping costs, Irrigation Costs, CVP water costs and higher crop prices. The CVP water cost component represents the impact to net revenue from changes in both the quantity of CVP water used and the price of CVP water. Therefore when the blended CVP water price increases, farmers frequently use less, and the net impact to the CVP water cost component can be positive even when the water price is higher. Table 15 summarizes the net income impacts by component. A negative entry in the table indicates a reduction in net revenue. A complete list of changes in net income by component for each subregion is provided as Table 19.

Relatively small net income impacts are seen in all water supply sequences at the State level. The Average-Average sequence compared to the Average year Preferred Alternative shows a decline of \$2 million in net revenue for all of California. The Wet-Average scenario is estimated to have a net increase of approximately \$4 million and the Dry-Average sequence a decrease of \$12 million.

The net revenue impact in wet years relative to the Preferred Alternative wet results show a pattern similar to the Average year results. Dry years preceded by a series of Average and Wet years both show net decrease in revenue of about \$12 million while the Dry-Dry sequence results in a \$15 million decrease in State wide net revenue relative the Preferred Alternative Dry results.

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Notice that following a series of dry years, the net revenue component associated with crop prices often results in a positive impact to net revenue. This occurs because some subregions are forced to reduce acreage because of higher blended CVP water prices, resulting in higher crop prices received for acreage that remains in production.

There is a negative impact to net revenue from irrigation costs in the Sacramento and San Joaquin River regions in each of the nine Long-Term Contract Renewal sequences. This impact is derived from the irrigation efficiency improvements induced by higher CVP water prices in the Average year sequences. The change in irrigation efficiency is carried through to the Wet and dry year sequences because they are short run analyses and irrigation technology is fixed in the short run. The increase in irrigation efficiency results in a reduction in the total water used in some subregions while irrigated acreage remains constant.

WATER USE

Table 16 summarizes water use changes by region. A complete list of changes in CVP water use and groundwater use by subregion is provided as Table 20. Water supplies other than CVP project water and groundwater are unaffected and not shown. The San Joaquin River region and most of the sequences for the Sacramento River region show the typical response represented by a shift away from CVP supplies to groundwater as CVP water becomes more expensive under the new pricing schemes. The Tulare Lake region and the Sacramento River region during wet years preceded by a series of Average and Wet years show what would be considered an atypical response.

In the Sacramento River region when five years of Wet and Average conditions are followed by a wet year, the model predicts that both groundwater and CVP water use will decline relative to the Preferred Alternative Wet condition. The decrease in groundwater use is mostly attributed to subregion 3b. In this subregion in a wet year coming out of a series of Average or Wet years the blended price is cheaper than the Preferred Alternative Tier 2 water cost as well as the cost of pumping groundwater. Therefore there is a shift away from groundwater to CVP supplies. In Average years preceded by Average or Wet years, the subregion is prevented from shifting to CVP because they are already using their full CVP supply.

In the Tulare Lake region there is a pattern of shifting from groundwater to CVP water that can be attributed to subregions 17. This subregion shifts because under the blended pricing scheme the CVP water becomes cheaper than pumping groundwater; therefore they maximize their CVP water use.

In average and wet years preceded by a series of dry years, there is a large decrease in CVP water use in both the Sacramento and San Joaquin River regions. This is driven by the relatively high cost of CVP supplies under these conditions. Since many subregions receive less water in dry years, or the water falls into the higher tiers and it becomes unaffordable, and the base from which the blended price tier quantities is calculated shrinks. This sets up a condition where when an Average or Wet year comes along, the additional water is classified as Category 2 and assessed the full cost price. The CVP blended price is a weighted average of all CVP supplies therefore the cost for all CVP water increases and the supplies often become unaffordable.

AGRICULTURAL LAND USE AND ECONOMICS

LOCALIZED IMPACTS

Certain subregions are substantially affected by the proposed water pricing.

- The Tehama-Colusa service area is the most-affected region. Limited groundwater availability and very high full-cost price relative to the value of water in agricultural production result in almost 60,000 acres out of production in the Dry-Average sequence and substantially higher cost for lands remaining in production. This analysis shows a one-year snapshot. Because water pricing is based on historic delivery, a region (such as the Tehama-Colusa region) may never be able to “buy its way” back out from a drought. Looked at over a sequence of dry years such as 1928-34 or 1987-92, many or most of the districts in this area could not survive as CVP contractors.
- The analysis predicts that the Delta subregion will make a complete switch to groundwater supplies in all nine hydrologic sequences, assuming groundwater is available in all parts of the service area.
- The analysis estimates that the once an extended drought is experienced the Delta-Mendota service area would switch from its CVP water service supply to groundwater, assuming groundwater is available in all parts of the service area.
- Westlands Water District and many of the Friant Unit contractors would likely continue purchasing CVP water. Since these areas continue to purchase CVP supplies in all years coming out of drought conditions, they would eventually build their base deliveries up or “buy their way” back to pre-drought tier quantities and prices.

TABLE 1
CVPM SUBREGIONS AND DESCRIPTIONS

CVPM Subregion	Description of Major Water Users
1	CVP Users: Anderson Cottonwood, Clear Creek, Bella Vista, Sacramento River miscellaneous users.
2	CVP Users: Corning Canal, Kirkwood, Tehema, Sacramento River, miscellaneous users.
3	CVP Users: Glenn Colusa ID, Provident, Princeton-Codora, Maxwell, and Colusa Basin Drain MWC.
3B	Tehama Colusa Canal Service Area. CVP Users: Orland-Artois WD, most of County of Colusa, Davis, Dunnigan, Glide Kanawha, La Grande, Westside WD.
4	CVP Users: Princeton-Codora-Glenn, Colusa Irrigation Co., Meridian Farm WC, Pelger Mutual WC, Recl. Dist. 1004, Recl. Dist. 108, Robers Ditch, Sartain M.D., Sutter MWC, Swinford Tract IC, Tisdale Irrigation, Sacramento River miscellaneous users.
5	Most Feather River Region riparian and appropriative users.
6	Yolo, Solano Counties. CVP Users: Conaway Ranch, Sacramento River miscellaneous users.
7	Sacramento Co. north of American River. CVP Users: Natomas Central MWC, Sacramento River miscellaneous users, Pheasant Grove-Verona, San Juan Suburban.
8	Sacramento Co. south of American River, San Joaquin Co.
9	Delta Regions. CVP Users: Banta Carbona, West Side, Plainview.
10	Delta Mendota Canal. CVP Users: Pacheco, Del Puerto, Hospital, Sunflower, West Stanislaus, Mustang, Orestimba, Patterson, Foothill, San Luis WD, Broadview, Eagle Field, Mercy Springs, Pool Exchange Contractors, Schedule II water rights, more.
11	Stanislaus River water rights: Modesto ID, Oakdale ID, South San Joaquin ID.
12	Turlock ID.
13	Merced ID. CVP Users: Madera, Chowchilla, Gravelly Ford.
14	CVP Users: Westlands WD.
15	Tulare Lake Bed. CVP Users: Fresno Slough, James, Tranquility, Traction Ranch, Laguna, Real. Dist. 1606.
16	Eastern Fresno Co. CVP Users: Friant-Kern Canal. Fresno ID, Garfield, International.
17	CVP Users: Friant-Kern Canal. Hills Valley, Tri-Valley Orange Cove.
18	CVP Users: Friant-Kern Canal, County of Fresno, Lower Tule River ID, Pixley ID, portion of Rag Gulch, Ducor, County of Tulare, most of Delano Earlimart, Exeter, Ivanhoe, Lewis Cr., Lindmore, Lindsay-Strathmore, Porterville, Sausalito, Stone Corral, Tea Pot Dome, Terra Bella, Tulare.
19	Kern Co. SWP Service Area.
20	CVP Users: Friant-Kern Canal. Shafter-Wasco, S. San Joaquin.
21	CVP Users: Cross Valley Canal, Friant-Kern Canal. Arvin Edison.

TABLE 2

CVP WATER RATES USED FOR LONG TERM CONTRACT RENEWAL ANALYSIS (\$)

CVPM Subregion	Tiered Water Rates Used for LTCR analysis			Proposed Blended Water Rates for Water Service Contracts								
	Tier 1	Tier 2	Tier 3	Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
				Followed by Average			Followed by Wet			Followed by Dry		
1	12.01	37.56	63.12	19.67	14.98	14.14	23.91	19.67	18.20	25.19	21.09	19.67
2	10.71	36.40	62.09	18.42	10.71	49.66	29.55	18.42	52.83	10.71	10.71	18.42
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3B	10.25	40.73	71.21	19.39	10.25	58.15	32.35	19.39	61.42	10.25	10.25	19.39
4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	20.65	23.01	25.36	21.35	21.18	21.77	21.52	21.35	21.92	20.90	20.81	21.35
6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7	11.77	12.07	12.37	11.86	11.86	11.86	11.86	11.86	11.86	11.86	11.86	11.86
8	10.00	27.46	44.92	15.24	10.00	30.36	25.64	15.24	35.47	10.00	10.00	15.24
9	24.79	55.14	85.50	33.89	24.79	64.53	55.27	33.89	73.22	24.79	24.79	33.89
10	31.15	40.16	49.16	33.85	31.15	42.94	38.01	33.85	44.63	31.15	31.15	33.85
11	0.00	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
12	0.00	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
13	32.16	38.41	44.65	34.04	33.25	37.44	34.77	34.04	37.94	32.16	32.16	34.04
14	32.62	46.48	60.33	36.78	32.62	50.76	43.17	36.78	53.36	32.62	32.62	36.78
15	32.71	41.91	51.10	35.47	34.55	38.10	36.34	35.47	38.82	33.07	32.71	35.47
16	40.48	46.78	53.08	42.37	41.22	45.32	43.40	42.37	46.07	40.48	40.48	42.37
17	34.18	40.49	46.79	36.07	35.15	39.28	36.92	36.07	39.88	34.18	34.18	36.07
18	33.63	40.48	47.33	35.69	34.73	39.16	36.57	35.69	39.78	33.63	33.63	35.69
19	34.58	42.16	49.73	36.86	35.00	41.21	38.84	36.86	42.52	34.58	34.58	36.86
20	34.58	42.16	49.73	36.86	35.70	40.85	37.92	36.86	41.58	34.58	34.58	36.86
21	32.70	39.00	45.31	34.59	32.98	39.01	36.33	34.59	40.03	32.70	32.70	34.59

NOTES:

1. Blended rates used pricing components from the November, 1999 Irrigation Water Rates spreadsheets, Restoration Charge of \$7.00
2. PEIS rates used regional estimates of payment capacity and allowed the same ATP relief in all tiers.
3. Blended rates use most recent available payment capacity studies from Reclamation, and allow ATP relief in Tier 1 but not in Tier 3.
4. Only Class 1 rates are shown for Friant Division. Friant surcharge is \$7.00 in all rates.

TABLE 3

CVP WATER RATES USED IN PREFERRED ALTERNATIVE (\$)

CVPM Subregion	Tiered Water Rates Used in the PEIS Preferred Alternative (\$)		
	Tier 1	Tier 2	Tier 3
1	5.91	14.63	23.35
2	11.83	24.7	37.57
3	2.83	5.27	7.71
3B	17.16	36.225	55.29
4	5.32	7.625	9.93
5	4.53	6.965	9.4
6	4.53	6.82	9.11
7	6.63	8.83	11.03
8	4.53	7.095	9.66
9	28.54	35.245	41.95
10	33.46	40.015	46.57
11	0	0	0
12	0	0	0
13	33.65	39.395	45.14
14	39.31	54.385	69.46
15	28.16	34.875	41.59
16	38.25	44.255	50.26
17	35.58	41.905	48.23
18	35.01	41.255	47.5
19	36.68	42.885	49.09
20	36.68	42.885	49.09
21	35.4	42.01	48.62

NOTES:

1. PEIS rates used pricing components from the 1994 Irrigation Water Rates Manual, Restoration Charge of \$6.50
2. PEIS rates used regional estimates of payment capacity and allowed the same ATP relief in all tiers.
3. Only Class 1 rates are shown for Friant Division. Friant surcharge is \$7.00 in all rates.

TABLE 4

**PROJECT WATER APPLIED BY PRICING TIERS
AVERAGE YEAR FOLLOWING AVERAGE 5-YEAR BASE CONDITION**

CVPM Subregion	Tier 1	Tier 2	Tier 3	Category 2	Blended Price (\$/AF)
	(1000 AF)				
1	9.4	1.2	1.2	-	\$ 19.67
2	21.9	2.7	2.7	-	\$ 18.42
3	-	-	-	-	NA
3B	159.7	20.0	20.0	-	\$ 19.39
4	-	-	-	-	NA
5	16.0	2.0	2.0	-	\$ 21.35
6	-	-	-	-	NA
7	12.0	1.5	1.5	-	\$ 11.86
8	41.3	5.2	5.2	-	\$ 15.24
9	22.5	2.8	2.8	-	\$ 33.89
10	231.4	28.9	28.9	-	\$ 33.85
11	-	-	-	-	
12	-	-	-	-	
13	153.6	19.2	19.2	-	\$ 34.04
14	539.1	67.4	67.4	-	\$ 36.78
15	32.3	4.0	4.0	-	\$ 35.47
16	18.9	2.4	2.4	-	\$ 42.37
17	34.9	4.4	4.4	-	\$ 36.07
18	484.2	60.5	60.5	-	\$ 35.69
19	13.1	1.6	1.6	-	\$ 36.86
20	194.2	24.3	24.3	-	\$ 36.86
21	129.7	16.2	16.2	-	\$ 34.59

Table 5

**PROJECT WATER APPLIED BY PRICING TIERS
AVERAGE YEAR FOLLOWING WET 5-YEAR BASE CONDITION**

CVPM Subregion	Tier 1	Tier 2	Tier 3	Category 2	Blended Price (\$/AF)
	(1000 AF)				
1	10.4	1.3	0.0	-	\$ 14.98
2	27.3	-	-	-	\$ 10.71
3	-	-	-	-	NA
3B	199.6	-	-	-	\$ 10.25
4	-	-	-	-	NA
5	16.6	2.1	1.2	-	\$ 21.18
6	-	-	-	-	NA
7	12.0	1.5	1.5	-	\$ 11.86
8	51.6	-	-	-	\$ 10.00
9	28.2	-	-	-	\$ 24.79
10	289.2	-	-	-	\$ 31.15
11	-	-	-	-	NA
12	-	-	-	-	NA
13	165.0	20.6	6.3	-	\$ 33.25
14	673.8	-	-	-	\$ 32.62
15	34.2	4.3	1.9	-	\$ 34.55
16	21.0	2.6	0.1	-	\$ 41.22
17	37.9	4.7	1.0	-	\$ 35.15
18	523.8	65.5	15.9	-	\$ 34.73
19	15.5	0.9	-	-	\$ 35.00
20	211.7	26.5	4.6	-	\$ 35.70
21	154.9	7.2	-	-	\$ 32.98

Table 6

**PROJECT WATER APPLIED BY PRICING TIERS
AVERAGE YEAR FOLLOWING DRY 5-YEAR BASE CONDITION**

CVPM Subregion	Tier 1	Tier 2	Tier 3	Category 2	Blended Price (\$/AF)
	(1000 AF)				
1	10.8	1.0	-	-	\$ 14.14
2	6.2	0.8	0.8	19.6	\$ 49.66
3	-	-	-	-	NA
3B	40.2	5.0	5.0	149.3	\$ 58.15
4	-	-	-	-	NA
5	14.3	1.8	1.8	2.1	\$ 21.77
6	-	-	-	-	NA
7	12.0	1.5	1.5	-	\$ 11.86
8	20.2	2.5	2.5	26.3	\$ 30.36
9	9.2	1.1	1.1	16.7	\$ 64.53
10	94.0	11.8	11.8	171.7	\$ 42.94
11	-	-	-	-	NA
12	-	-	-	-	NA
13	104.4	13.0	13.0	61.6	\$ 37.44
14	219.1	27.4	27.4	400.0	\$ 50.76
15	26.8	3.4	3.4	6.8	\$ 38.10
16	13.7	1.7	1.7	6.5	\$ 45.32
17	24.5	3.1	3.1	13.1	\$ 39.28
18	339.7	42.5	42.5	180.6	\$ 39.16
19	8.7	1.1	1.1	5.6	\$ 41.21
20	133.9	16.7	16.7	75.3	\$ 40.85
21	76.2	9.5	9.5	66.8	\$ 39.01

Table 7

**PROJECT WATER APPLIED BY PRICING TIERS
WET YEAR FOLLOWING AVERAGE 5-YEAR BASE CONDITION**

CVPM Subregion	Tier 1	Tier 2	Tier 3	Category 2	Blended Price (\$/AF)
	(1000 AF)				
1	9.4	1.2	1.2	1.3	\$ 23.91
2	21.9	2.7	2.7	9.4	\$ 29.55
3	-	-	-	-	NA
3B	159.7	20.0	20.0	66.6	\$ 32.35
4	-	-	-	-	NA
5	16.0	2.0	2.0	0.9	\$ 21.52
6	-	-	-	-	NA
7	12.0	1.5	1.5	-	\$ 11.86
8	41.3	5.2	5.2	27.8	\$ 25.64
9	22.5	2.8	2.8	19.9	\$ 55.27
10	231.4	28.9	28.9	107.8	\$ 38.01
11	-	-	-	-	NA
12	-	-	-	-	NA
13	153.6	19.2	19.2	14.3	\$ 34.77
14	539.1	67.4	67.4	251.2	\$ 43.17
15	32.3	4.0	4.0	2.4	\$ 36.34
16	18.9	2.4	2.4	2.5	\$ 43.40
17	34.9	4.4	4.4	3.8	\$ 36.92
18	484.2	60.5	60.5	49.6	\$ 36.57
19	13.1	1.6	1.6	3.0	\$ 38.84
20	194.2	24.3	24.3	21.9	\$ 37.92
21	129.7	16.2	16.2	31.5	\$ 36.33

Table 8

**PROJECT WATER BY PRICING TIERS
WET YEAR FOLLOWING WET 5-YEAR BASE CONDITION**

CVPM Subregion	Tier 1	Tier 2	Tier 3	Category 2	Blended Price (\$/AF)
	(1000 AF)				
1	10.4	1.3	1.3	-	\$ 19.67
2	29.4	3.7	3.7	-	\$ 18.42
3	-	-	-	-	NA
3B	212.9	26.6	26.6	-	\$ 19.39
4	-	-	-	-	NA
5	16.6	2.1	2.1	-	\$ 21.35
6	-	-	-	-	NA
7	12.0	1.5	1.5	-	\$ 11.86
8	63.5	7.9	7.9	-	\$ 15.24
9	38.5	4.8	4.8	-	\$ 33.89
10	317.6	39.7	39.7	-	\$ 33.85
11	-	-	-	-	NA
12	-	-	-	-	NA
13	165.0	20.6	20.6	-	\$ 34.04
14	740.0	92.5	92.5	-	\$ 36.78
15	34.2	4.3	4.3	-	\$ 35.47
16	21.0	2.6	2.6	-	\$ 42.37
17	37.9	4.7	4.7	-	\$ 36.07
18	523.8	65.5	65.5	-	\$ 35.69
19	15.5	1.9	1.9	-	\$ 36.86
20	211.7	26.5	26.5	-	\$ 36.86
21	154.9	19.4	19.4	-	\$ 34.59

Table 9

**PROJECT WATER APPLIED BY PRICING TIERS
WET YEAR FOLLOWING DRY 5-YEAR BASE CONDITION**

CVPM Subregion	Tier 1	Tier 2	Tier 3	Category 2	Blended Price (\$/AF)
	(1000 AF)				
1	10.8	1.3	0.9	-	\$ 18.20
2	6.2	0.8	0.8	28.9	\$ 52.83
3	-	-	-	-	NA
3B	40.2	5.0	5.0	215.9	\$ 61.42
4	-	-	-	-	NA
5	14.3	1.8	1.8	2.9	\$ 21.92
6	-	-	-	-	NA
7	12.0	1.5	1.5	-	\$ 11.86
8	20.2	2.5	2.5	54.1	\$ 35.47
9	9.2	1.1	1.1	36.7	\$ 73.22
10	94.0	11.8	11.8	279.5	\$ 44.63
11	-	-	-	-	NA
12	-	-	-	-	NA
13	104.4	13.0	13.0	75.9	\$ 37.94
14	219.1	27.4	27.4	651.1	\$ 53.36
15	26.8	3.4	3.4	9.1	\$ 38.82
16	13.7	1.7	1.7	9.1	\$ 46.07
17	24.5	3.1	3.1	16.8	\$ 39.88
18	339.7	42.5	42.5	230.2	\$ 39.78
19	8.7	1.1	1.1	8.5	\$ 42.52
20	133.9	16.7	16.7	97.2	\$ 41.58
21	76.2	9.5	9.5	98.3	\$ 40.03

Table 10

**PROJECT WATER APPLIED BY PRICING TIERS
 DRY YEAR FOLLOWING AVERAGE 5-YEAR BASE CONDITION**

CVPM Subregion	Tier 1	Tier 2	Tier 3	Category 2	Blended Price (\$/AF)
	(1000 AF)				
1	9.4	1.2	1.2	1.7	\$ 25.19
2	7.8	-	-	-	\$ 10.71
3	-	-	-	-	NA
3B	50.3	-	-	-	\$ 10.25
4	-	-	-	-	NA
5	16.0	1.9	-	-	\$ 20.90
6	-	-	-	-	NA
7	12.0	1.5	1.5	-	\$ 11.86
8	25.3	-	-	-	\$ 10.00
9	11.5	-	-	-	\$ 24.79
10	117.5	-	-	-	\$ 31.15
11	-	-	-	-	NA
12	-	-	-	-	NA
13	130.4	-	-	-	\$ 32.16
14	273.9	-	-	-	\$ 32.62
15	32.3	1.3	-	-	\$ 33.07
16	17.1	-	-	-	\$ 40.48
17	30.6	-	-	-	\$ 34.18
18	424.6	-	-	-	\$ 33.63
19	10.9	-	-	-	\$ 34.58
20	167.4	-	-	-	\$ 34.58
21	95.3	-	-	-	\$ 32.70

Table 11

**PROJECT WATER APPLIED BY PRICING TIERS
DRY YEAR FOLLOWING WET 5-YEAR BASE CONDITION**

CVPM Subregion	Tier 1	Tier 2	Tier 3	Category 2	Blended Price (\$/AF)
	(1000 AF)				
1	10.4	1.3	1.3	0.4	\$ 21.09
2	7.8	-	-	-	\$ 10.71
3	-	-	-	-	NA
3B	50.3	-	-	-	\$ 10.25
4	-	-	-	-	NA
5	16.6	1.2	-	-	\$ 20.81
6	-	-	-	-	NA
7	12.0	1.5	1.5	-	\$ 11.86
8	25.3	-	-	-	\$ 10.00
9	11.5	-	-	-	\$ 24.79
10	117.5	-	-	-	\$ 31.15
11	-	-	-	-	NA
12	-	-	-	-	NA
13	130.4	-	-	-	\$ 32.16
14	273.9	-	-	-	\$ 32.62
15	33.6	-	-	-	\$ 32.71
16	17.1	-	-	-	\$ 40.48
17	30.6	-	-	-	\$ 34.18
18	424.6	-	-	-	\$ 33.63
19	10.9	-	-	-	\$ 34.58
20	167.4	-	-	-	\$ 34.58
21	95.3	-	-	-	\$ 32.70

Table 12

**PROJECT WATER BY PRICING TIERS
DRY YEAR FOLLOWING DRY 5-YEAR BASE CONDITION**

CVPM Subregion	Tier 1	Tier 2	Tier 3	Category 2	Blended Price (\$/AF)
	(1000 AF)				
1	10.8	1.3	1.3	-	\$ 19.67
2	6.2	0.8	0.8	-	\$ 18.42
3	-	-	-	-	NA
3B	40.2	5.0	5.0	-	\$ 19.39
4	-	-	-	-	NA
5	14.3	1.8	1.8	-	\$ 21.35
6	-	-	-	-	NA
7	12.0	1.5	1.5	-	\$ 11.86
8	20.2	2.5	2.5	-	\$ 15.24
9	9.2	1.1	1.1	-	\$ 33.89
10	94.0	11.8	11.8	-	\$ 33.85
11	-	-	-	-	NA
12	-	-	-	-	NA
13	104.4	13.0	13.0	-	\$ 34.04
14	219.1	27.4	27.4	-	\$ 36.78
15	26.8	3.4	3.4	-	\$ 35.47
16	13.7	1.7	1.7	-	\$ 42.37
17	24.5	3.1	3.1	-	\$ 36.07
18	339.7	42.5	42.5	-	\$ 35.69
19	8.7	1.1	1.1	-	\$ 36.86
20	133.9	16.7	16.7	-	\$ 36.86
21	76.2	9.5	9.5	-	\$ 34.59

TABLE 13

IRRIGATED ACRES BY SUBREGION (1000 ACRES)

CVPM Subregion	Average Preferred Alternative	Change Compared to			Wet Preferred Alternative	Change Compared to			Dry Preferred Alternative	Change Compared to		
		Average	Wet	Dry		Average	Wet	Dry		Average	Wet	Dry
		followed by Average				followed by Wet				followed by Dry		
Sacramento River	2015.5	-1.7	-0.8	-65.3	2020.0	-4.4	-4.4	-53.0	1984.8	0.1	0.1	0.0
San Joaquin River	2526.6	-0.2	-0.2	-1.2	2529.1	-1.7	-1.6	-1.9	2505.9	-0.1	-0.1	-0.1
Tulare Lake	1992.4	0.0	0.0	-0.2	1996.2	-1.2	-1.2	-1.3	1953.7	0.1	0.1	0.1
San Felipe	50.7	0.0	0.0	0.0	69.5	0.0	0.0	0.0	22.2	0.0	0.0	0.0
California Total	6585.2	-1.9	-1.0	-66.7	6614.8	-7.3	-7.3	-56.2	6466.6	0.1	0.1	0.1

TABLE 14

VALUE OF PRODUCTION BY SUBREGION (Million \$)

CVPM Subregion	Average Preferred Alternative	Change Compared to Average			Wet Preferred Alternative	Change Compared to Wet PA			Dry Preferred Alternative	Change Compared to Dry PA		
		Average	Wet	Dry		Average	Wet	Dry		Average	Wet	Dry
		followed by Average				followed by Wet				followed by Dry		
Sacramento River	1,825.3	-0.4	-0.2	-37.6	1,828.0	-1.6	-1.6	-26.8	1,810.0	0.4	0.4	0.3
San Joaquin River	4,402.3	-0.1	-0.1	-1.0	4,403.8	-0.9	-0.9	-1.1	4,384.2	-0.2	-0.2	-0.2
Tulare Lake	3,876.3	0.0	0.0	-0.3	3,879.4	-1.0	-1.0	-1.1	3,842.7	0.1	0.1	0.1
San Felipe	68.0	0.0	0.0	0.0	70.0	0.0	0.0	0.0	44.0	0.0	0.0	0.0
California Total	10,172.0	-0.5	-0.4	-38.8	10,181.2	-3.6	-3.6	-28.9	10,080.8	0.3	0.3	0.3

Cause of Net Revenue Change	Compared to Average Year PA			Compared to Wet Year PA			Compared to Dry Year PA		
	Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
	followed by Average			followed by Wet			followed by Dry		
Sacramento River									
Fallowed Land	-0.1	0.0	-6.7	-0.3	-0.3	-4.6	0.0	0.0	0.0
Groundwater Pumping Cost	-0.3	-0.3	-0.4	1.0	1.0	-4.5	-0.2	-0.2	-0.2
Irrigation Cost	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
CVP Water Cost	-0.3	1.7	3.6	-5.1	-1.0	4.6	-0.1	-0.1	-0.7
Higher Crop Prices	0.0	0.0	1.9	0.1	0.1	1.0	0.0	0.0	0.0
Net Change	-1.0	1.0	-1.9	-4.6	-0.5	-3.8	-0.6	-0.6	-1.2
San Joaquin River									
Fallowed Land	0.0	0.0	-0.1	-0.2	-0.2	-0.2	0.0	0.0	0.0
Groundwater Pumping Cost	0.0	0.0	-10.3	-7.4	0.2	-14.1	-1.0	-1.0	-1.0
Irrigation Cost	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
CVP Water Cost	1.0	4.0	2.3	7.9	6.1	6.2	-5.9	-5.9	-7.5
Higher Crop Prices	0.1	0.0	2.5	0.2	0.2	1.0	0.0	0.0	0.0
Net Change	0.9	3.9	-5.7	0.4	6.1	-7.3	-7.0	-7.0	-8.6
Tulare Lake									
Fallowed Land	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0
Groundwater Pumping Cost	0.1	0.1	0.1	1.0	1.0	1.0	-3.2	-3.2	-3.2
Irrigation Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CVP Water Cost	-2.3	-1.2	-5.7	-3.1	-2.1	-6.4	-0.9	-0.9	-2.3
Higher Crop Prices	0.0	0.0	1.4	0.1	0.1	0.4	0.0	0.0	0.0
Net Change	-2.1	-1.1	-4.2	-2.1	-1.1	-5.1	-4.1	-4.1	-5.5
San Felipe									
Fallowed Land	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groundwater Pumping Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigation Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CVP Water Cost	-0.2	0.0	-0.6	-0.5	-0.2	-0.9	0.0	0.0	-0.1
Higher Crop Prices	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Change	-0.2	0.0	-0.6	-0.5	-0.2	-0.9	0.0	0.0	-0.1
Total									
Fallowed Land	-0.1	-0.1	-6.9	-0.6	-0.6	-4.9	0.0	0.0	0.0
Groundwater Pumping Cost	-0.2	-0.2	-10.5	-5.3	2.2	-17.6	-4.4	-4.4	-4.4
Irrigation Cost	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
CVP Water Cost	-1.6	4.5	0.2	-0.3	3.1	4.5	-6.9	-6.8	-10.5
Higher Crop Prices	0.1	0.1	5.8	0.4	0.4	2.3	0.0	0.0	0.0
Net Change	-2.3	3.7	-11.9	-6.3	4.6	-16.1	-11.7	-11.7	-15.3
Note: A negative value in a cost category represents an increase in cost that produces a decrease in net revenue									

TABLE 16

*CVP water applied is project water only. It excludes exchange contract delivery and the base supply portion of settlement contracts.

TABLE 17 IRRIGATED ACREAGE BY SUBREGION

CVPM Subregion	Crop Category	Preferred Alternative Average	Changes Compared to Average P			Preferred Alternative Wet	Changes Compared to Wet PA			Preferred Alternative Dry	Changes Compared to Dry PA		
			Average	Wet	Dry		Average	Wet	Dry		Average	Wet	Dry
			Followed by Average				Followed by Wet				Followed by Dry		
1	Pasture	18.3	-1.2	-0.3	-0.1	18.3	-1.5	-1.5	-1.5	18.1	-1.8	-1.8	-1.8
	Alfalfa	0.9	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.9	0.0	0.0	0.0
	Other Field Crops	1.2	0.0	0.0	0.0	1.2	0.0	0.0	0.0	1.2	0.0	0.0	0.0
	Deciduous Orchard	3.8	0.0	0.0	0.0	3.8	0.0	0.0	0.0	3.8	0.0	0.0	0.0
	Small Grain	2.4	0.0	0.0	0.0	2.4	0.0	0.0	0.0	2.4	0.0	0.0	0.0
	Subtotal	26.6	-1.3	-0.3	-0.1	26.5	-1.6	-1.6	-1.6	26.3	-1.9	-1.9	-1.9
2	Pasture	34.1	0.0	0.0	-3.6	33.9	0.0	0.0	-5.9	33.1	0.0	0.0	0.0
	Alfalfa	9.5	0.0	0.0	-0.3	9.5	0.0	0.0	-0.6	9.4	0.0	0.0	0.0
	Sugar Beets	4.0	0.0	0.0	0.0	4.0	0.0	0.0	-0.1	4.0	0.0	0.0	0.0
	Other Field Crops	17.3	0.0	0.0	-0.5	17.2	0.0	0.0	-0.7	17.1	0.0	0.0	0.0
	Rice	4.5	0.0	0.0	-0.2	4.5	0.0	0.0	-0.3	4.5	0.0	0.0	0.0
	Truck Crops	15.5	0.0	0.0	0.0	15.5	0.0	0.0	0.0	15.5	0.0	0.0	0.0
	Deciduous Orchard	86.0	0.0	0.0	-0.1	86.0	0.0	0.0	0.0	86.0	0.0	0.0	0.0
	Small Grain	14.0	0.0	0.0	-0.2	13.9	0.0	0.0	-0.6	13.7	0.0	0.0	0.0
	Subtropical Orchard	10.2	0.0	0.0	0.0	10.2	0.0	0.0	0.0	10.2	0.0	0.0	0.0
	Subtotal	195.0	0.0	0.0	-4.9	194.7	0.0	0.0	-8.2	193.5	0.0	0.0	0.0
3	Pasture	7.8	0.0	0.0	0.0	7.9	0.0	0.0	0.0	7.5	0.0	0.0	0.0
	Alfalfa	18.2	0.0	0.0	0.0	18.3	0.0	0.0	0.0	18.0	0.0	0.0	0.0
	Sugar Beets	9.9	0.0	0.0	0.0	9.9	0.0	0.0	0.0	9.8	0.0	0.0	0.0
	Other Field Crops	15.7	0.0	0.0	0.0	15.8	0.0	0.0	0.0	15.5	0.0	0.0	0.0
	Rice	138.9	0.0	0.0	0.0	139.5	0.0	0.0	0.0	136.7	0.0	0.0	0.0
	Truck Crops	25.2	0.0	0.0	0.0	25.2	0.0	0.0	0.0	25.2	0.0	0.0	0.0
	Tomatoes	25.9	0.0	0.0	0.0	25.9	0.0	0.0	0.0	25.8	0.0	0.0	0.0
	Deciduous Orchard	17.8	0.0	0.0	0.0	17.8	0.0	0.0	0.0	17.8	0.0	0.0	0.0
	Small Grain	30.5	0.0	0.0	0.0	30.6	0.0	0.0	0.0	29.8	0.0	0.0	0.0
	Subtotal	289.8	0.0	0.0	0.0	290.7	0.0	0.0	0.0	286.2	0.0	0.0	0.0
3B	Pasture	5.7	0.0	0.0	-5.7	5.8	0.1	0.1	-1.5	4.3	0.0	0.0	0.0
	Alfalfa	10.1	0.0	0.0	-10.1	10.2	0.1	0.1	-2.6	7.6	0.0	0.0	0.0
	Sugar Beets	5.6	0.0	0.0	-5.3	5.6	0.0	0.0	-2.8	5.1	0.0	0.0	0.0
	Other Field Crops	13.4	0.0	0.0	-13.4	13.5	0.0	0.0	-13.5	10.4	0.0	0.0	0.0
	Rice	9.6	0.0	0.0	-9.6	9.7	0.1	0.1	-9.7	6.2	0.0	0.0	0.0
	Truck Crops	0.6	0.0	0.0	-0.1	0.6	0.0	0.0	0.0	0.6	0.0	0.0	0.0
	Tomatoes	6.1	0.0	0.0	-3.8	6.1	0.0	0.0	-1.8	5.7	0.0	0.0	0.0
	Deciduous Orchard	26.9	0.0	0.0	-3.3	26.9	0.0	0.0	0.0	26.9	0.0	0.0	0.0
	Small Grain	8.5	0.0	0.0	-8.5	8.6	0.0	0.0	-8.6	6.2	0.0	0.0	0.0
	Subtropical Orchard	1.0	0.0	0.0	-0.1	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	Subtotal	87.6	0.0	0.0	-59.9	87.9	0.3	0.3	-40.4	74.0	0.0	0.0	0.0

4	Pasture	1.2	0.0	0.0	0.0	1.2	0.0	0.0	0.0	1.1	0.0	0.0	0.0
	Alfalfa	6.8	0.0	0.0	0.0	6.8	0.0	0.0	0.0	6.8	0.0	0.0	0.0
	Sugar Beets	10.3	0.0	0.0	0.0	10.3	0.0	0.0	0.0	10.3	0.0	0.0	0.0
	Other Field Crops	40.1	0.0	0.0	0.0	40.1	0.0	0.0	0.0	39.8	0.0	0.0	0.0
	Rice	87.8	0.0	0.0	0.0	87.9	0.0	0.0	0.0	87.1	0.0	0.0	0.0
	Truck Crops	17.1	0.0	0.0	0.0	17.1	0.0	0.0	0.0	17.1	0.0	0.0	0.0
	Tomatoes	34.1	0.0	0.0	0.0	34.1	0.0	0.0	0.0	34.0	0.0	0.0	0.0
	Deciduous Orchard	30.6	0.0	0.0	0.0	30.6	0.0	0.0	0.0	30.6	0.0	0.0	0.0
	Small Grain	47.5	0.0	0.0	0.0	47.6	0.0	0.0	0.0	46.8	0.0	0.0	0.0
	Subtotal	275.3	0.0	0.0	0.0	275.7	0.0	0.0	-0.1	273.6	0.0	0.0	0.0
5	Pasture	21.4	0.0	0.0	0.0	21.5	0.0	0.0	0.0	21.0	0.0	0.0	0.0
	Alfalfa	4.7	0.0	0.0	0.0	4.7	0.0	0.0	0.0	4.7	0.0	0.0	0.0
	Sugar Beets	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
	Other Field Crops	15.4	0.0	0.0	0.0	15.4	0.0	0.0	0.0	15.4	0.0	0.0	0.0
	Rice	166.0	0.0	0.0	0.0	166.6	-0.1	-0.1	-0.1	165.2	-0.1	-0.1	-0.1
	Truck Crops	6.6	0.0	0.0	0.0	6.6	0.0	0.0	0.0	6.6	0.0	0.0	0.0
	Tomatoes	1.6	0.0	0.0	0.0	1.6	0.0	0.0	0.0	1.6	0.0	0.0	0.0
	Deciduous Orchard	121.6	0.0	0.0	0.0	121.6	0.0	0.0	0.0	121.6	0.0	0.0	0.0
	Small Grain	22.3	0.0	0.0	0.0	22.4	0.0	0.0	0.0	21.9	0.0	0.0	0.0
	Subtropical Orchard	2.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0
	Subtotal	364.1	0.0	0.0	0.0	364.9	-0.2	-0.2	-0.1	362.4	-0.2	-0.2	-0.2
6	Pasture	12.1	0.0	0.0	0.0	12.5	-0.4	-0.4	-0.4	11.8	0.0	0.0	0.0
	Alfalfa	28.7	0.0	0.0	0.1	29.0	-0.3	-0.3	-0.3	28.6	0.0	0.0	0.0
	Sugar Beets	21.2	0.0	0.0	0.0	21.2	-0.1	-0.1	-0.1	21.1	0.0	0.0	0.0
	Other Field Crops	59.4	0.0	0.0	0.0	59.9	-0.5	-0.5	-0.5	59.1	0.0	0.0	0.0
	Rice	12.9	0.0	0.0	0.0	13.1	-0.2	-0.2	-0.2	12.8	0.0	0.0	0.0
	Truck Crops	3.4	0.0	0.0	0.0	3.4	0.0	0.0	0.0	3.4	0.0	0.0	0.0
	Tomatoes	45.8	0.0	0.0	0.0	45.9	-0.1	-0.1	-0.1	45.7	0.0	0.0	0.0
	Deciduous Orchard	24.6	0.0	0.0	0.0	24.6	0.0	0.0	0.0	24.6	0.0	0.0	0.0
	Small Grain	64.3	0.0	0.0	0.0	64.6	-0.4	-0.4	-0.4	63.3	0.2	0.2	0.2
	Grapes	8.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0
	Subtotal	280.2	0.0	0.0	0.0	282.2	-1.9	-1.9	-1.8	278.4	0.2	0.2	0.2
7	Pasture	14.5	0.0	0.0	0.0	14.5	0.0	0.0	0.0	14.2	0.0	0.0	0.0
	Alfalfa	3.1	0.0	0.0	0.0	3.1	0.0	0.0	0.0	3.1	0.0	0.0	0.0
	Sugar Beets	2.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0
	Other Field Crops	3.8	0.0	0.0	0.0	3.8	0.0	0.0	0.0	3.8	0.0	0.0	0.0
	Rice	48.3	0.0	0.0	0.0	48.3	0.0	0.0	0.0	47.9	0.0	0.0	0.0
	Truck Crops	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0
	Tomatoes	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0
	Deciduous Orchard	8.9	0.0	0.0	0.0	8.9	0.0	0.0	0.0	8.9	0.0	0.0	0.0
	Small Grain	9.4	0.0	0.0	0.0	9.3	0.0	0.0	0.0	9.2	0.0	0.0	0.0
	Grapes	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0
	Subtotal	91.4	0.0	0.0	0.0	91.5	0.0	0.0	0.0	90.5	0.0	0.0	0.0

8	Pasture	47.7	0.0	0.0	0.0	47.6	0.0	0.0	0.0	46.9	0.0	0.0	0.0
	Alfalfa	12.3	0.0	0.0	0.0	12.3	0.0	0.0	0.0	12.2	0.0	0.0	0.0
	Sugar Beets	12.8	0.0	0.0	0.0	12.8	0.0	0.0	0.0	12.8	0.0	0.0	0.0
	Other Field Crops	42.7	0.0	0.0	0.0	42.7	0.0	0.0	0.0	42.5	0.0	0.0	0.0
	Rice	4.5	0.0	0.0	0.0	4.5	0.0	0.0	0.0	4.5	0.0	0.0	0.0
	Truck Crops	17.1	0.0	0.0	0.0	17.1	0.0	0.0	0.0	17.1	0.0	0.0	0.0
	Tomatoes	12.9	0.0	0.0	0.0	12.9	0.0	0.0	0.0	12.9	0.0	0.0	0.0
	Deciduous Orchard	46.9	0.0	0.0	0.0	46.9	0.0	0.0	0.0	46.9	0.0	0.0	0.0
	Small Grain	29.0	0.0	0.0	0.0	29.1	0.0	0.0	0.0	28.2	0.0	0.0	0.0
	Grapes	58.9	0.0	0.0	0.0	58.9	0.0	0.0	0.0	58.9	0.0	0.0	0.0
	Subtotal	284.8	0.0	0.0	0.0	284.9	0.0	0.0	0.0	282.8	0.0	0.0	0.0
9	Pasture	24.6	-0.2	-0.2	-0.1	24.6	-0.4	-0.4	-0.4	23.4	0.7	0.7	0.7
	Alfalfa	43.8	-0.1	-0.1	0.0	43.8	-0.2	-0.2	-0.2	43.1	0.4	0.4	0.4
	Sugar Beets	28.6	0.0	0.0	0.0	28.6	-0.1	-0.1	0.0	28.5	0.1	0.1	0.1
	Other Field Crops	114.9	-0.2	-0.2	-0.2	115.0	-0.4	-0.4	-0.4	113.6	0.7	0.7	0.7
	Rice	0.9	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.9	0.0	0.0	0.0
	Truck Crops	46.0	0.0	0.0	0.0	46.0	0.0	0.0	0.0	46.0	0.0	0.0	0.0
	Tomatoes	42.5	0.0	0.0	0.0	42.5	0.0	0.0	0.0	42.3	0.1	0.1	0.1
	Deciduous Orchard	21.3	0.0	0.0	0.0	21.3	0.0	0.0	0.0	21.3	0.0	0.0	0.0
	Small Grain	96.8	-0.1	-0.1	-0.1	97.5	-0.3	-0.3	-0.3	93.7	1.0	1.0	1.0
	Grapes	5.8	0.0	0.0	0.0	5.8	0.0	0.0	0.0	5.8	0.0	0.0	0.0
	Subtotal	425.0	-0.6	-0.6	-0.4	425.9	-1.5	-1.5	-1.4	418.4	3.0	3.0	3.0
10	Pasture	13.3	0.0	0.0	-0.2	13.3	0.0	0.0	0.0	13.3	0.0	0.0	0.0
	Alfalfa	40.8	0.0	0.0	-0.3	40.9	-0.1	0.0	-0.1	40.8	0.0	0.0	0.0
	Sugar Beets	13.9	0.0	0.0	0.0	13.9	0.0	0.0	0.0	13.9	0.0	0.0	0.0
	Other Field Crops	48.2	0.0	0.0	-0.1	48.2	0.1	0.0	0.0	48.3	0.0	0.0	0.0
	Rice	2.9	0.0	0.0	0.0	2.9	0.0	0.0	0.0	2.9	0.0	0.0	0.0
	Truck Crops	112.9	0.0	0.0	0.0	112.9	0.0	0.0	0.0	113.0	0.0	0.0	0.0
	Tomatoes	40.2	0.0	0.0	0.0	40.2	0.0	0.0	0.0	40.2	0.0	0.0	0.0
	Deciduous Orchard	36.6	0.0	0.0	0.0	36.6	0.0	0.0	0.0	36.6	0.0	0.0	0.0
	Small Grain	14.0	0.0	0.0	0.0	14.0	0.1	0.0	0.1	14.0	0.0	0.0	0.0
	Grapes	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	Cotton	103.1	0.0	0.0	-0.5	103.1	-0.1	0.0	-0.1	103.1	0.0	0.0	0.0
	Subtropical Orchard	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Subtotal	427.1	0.0	0.0	-1.1	427.2	-0.1	0.0	-0.1	427.1	0.0	0.0	0.0
11	Pasture	42.9	0.0	0.0	0.0	43.0	0.0	0.0	0.0	42.7	0.0	0.0	0.0
	Alfalfa	8.4	0.0	0.0	0.0	8.4	0.0	0.0	0.0	8.3	0.0	0.0	0.0
	Sugar Beets	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0
	Other Field Crops	17.8	0.0	0.0	0.0	17.9	0.0	0.0	0.0	17.8	0.0	0.0	0.0
	Rice	4.4	0.0	0.0	0.0	4.4	0.0	0.0	0.0	4.4	0.0	0.0	0.0
	Truck Crops	6.3	0.0	0.0	0.0	6.3	0.0	0.0	0.0	6.3	0.0	0.0	0.0
	Tomatoes	0.8	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.8	0.0	0.0	0.0
	Deciduous Orchard	80.8	0.0	0.0	0.0	80.8	0.0	0.0	0.0	80.8	0.0	0.0	0.0
	Small Grain	1.8	0.0	0.0	0.0	1.8	0.0	0.0	0.0	1.8	0.0	0.0	0.0
	Grapes	10.4	0.0	0.0	0.0	10.4	0.0	0.0	0.0	10.4	0.0	0.0	0.0
	Subtotal	174.0	0.0	0.0	0.0	174.2	0.0	0.0	0.0	173.7	0.0	0.0	0.0

12	Pasture	18.3	0.0	0.0	0.0	18.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0
	Alfalfa	18.2	0.0	0.0	0.0	18.1	0.0	0.0	0.0	18.1	0.0	0.0	0.0
	Sugar Beets	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Other Field Crops	41.2	0.0	0.0	0.0	41.0	0.0	0.0	0.0	41.0	0.0	0.0	0.0
	Truck Crops	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0
	Deciduous Orchard	94.0	0.0	0.0	0.0	94.0	0.0	0.0	0.0	94.0	0.0	0.0	0.0
	Small Grain	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	9.9	0.0	0.0	0.0
	Grapes	14.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0
	Cotton	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	Subtropical Orchard	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	Subtotal	200.8	0.0	0.0	0.0	200.2	0.0	0.0	0.0	200.1	0.0	0.0	0.0
13	Pasture	39.6	0.0	0.0	0.0	39.9	-0.2	-0.2	-0.3	39.5	-0.3	-0.3	-0.3
	Alfalfa	41.8	0.0	0.0	0.1	42.1	-0.2	-0.2	-0.2	41.8	-0.2	-0.2	-0.2
	Sugar Beets	5.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0
	Other Field Crops	54.8	0.0	0.0	0.0	55.0	-0.1	-0.1	-0.2	54.6	-0.1	-0.1	-0.1
	Rice	3.9	0.0	0.0	0.0	3.9	0.0	0.0	0.0	3.9	0.0	0.0	0.0
	Truck Crops	18.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0
	Tomatoes	7.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0
	Deciduous Orchard	135.0	0.0	0.0	0.0	135.0	0.0	0.0	0.0	135.0	0.0	0.0	0.0
	Small Grain	46.9	0.0	0.0	0.0	47.2	-0.1	-0.1	-0.1	46.4	-0.1	-0.1	-0.1
	Grapes	99.0	0.0	0.0	0.0	99.0	0.0	0.0	0.0	99.0	0.0	0.0	0.0
	Cotton	71.8	0.0	0.0	0.0	72.1	-0.2	-0.2	-0.3	71.6	-0.2	-0.2	-0.2
	Subtropical Orchard	9.9	0.0	0.0	0.0	9.9	0.0	0.0	0.0	9.9	0.0	0.0	0.0
	Subtotal	532.5	0.0	0.0	0.0	534.1	-0.9	-0.9	-1.1	531.6	-0.9	-0.9	-0.9
14	Pasture	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Alfalfa	14.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	13.4	0.0	0.0	0.0
	Sugar Beets	4.8	0.0	0.0	0.0	4.8	0.0	0.0	0.0	4.8	0.0	0.0	0.0
	Other Field Crops	18.4	0.0	0.0	0.0	18.3	0.0	0.0	0.0	17.9	0.0	0.0	0.0
	Truck Crops	136.4	0.0	0.0	0.0	136.4	0.0	0.0	0.0	136.2	0.0	0.0	0.0
	Tomatoes	77.0	0.0	0.0	0.1	77.0	0.0	0.0	0.0	76.2	0.0	0.0	0.0
	Deciduous Orchard	24.9	0.0	0.0	0.0	24.9	0.0	0.0	0.0	24.9	0.0	0.0	0.0
	Small Grain	10.4	0.0	0.0	0.0	10.4	0.0	0.0	0.0	9.7	0.0	0.0	0.0
	Grapes	7.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0
	Cotton	206.5	0.0	0.0	-0.1	206.6	0.0	0.0	0.0	198.8	0.0	0.0	0.0
	Subtropical Orchard	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	Subtotal	500.4	0.0	0.0	0.0	500.5	0.0	0.0	0.0	489.9	0.0	0.0	0.0

15	Pasture	3.9	0.0	0.0	0.0	3.9	0.0	0.0	0.0	3.7	0.0	0.0	0.0
	Alfalfa	83.1	0.0	0.0	0.2	83.4	0.0	0.0	0.1	80.6	0.0	0.0	0.0
	Sugar Beets	5.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0
	Other Field Crops	86.0	0.0	0.0	0.0	86.1	0.0	0.0	0.0	84.2	0.0	0.0	0.0
	Rice	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Truck Crops	12.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0
	Tomatoes	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
	Deciduous Orchard	38.0	0.0	0.0	0.0	38.0	0.0	0.0	0.0	38.0	0.0	0.0	0.0
	Small Grain	71.0	0.0	0.0	0.0	71.6	0.0	0.0	0.0	67.9	0.0	0.0	0.0
	Grapes	56.0	0.0	0.0	0.0	56.0	0.0	0.0	0.0	56.0	0.0	0.0	0.0
	Cotton	242.1	0.0	0.0	-0.2	242.7	0.0	0.0	-0.1	235.5	0.0	0.0	0.0
	Subtropical Orchard	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Subtotal		600.1	0.0	0.0	-0.1	601.7	0.0	0.0	0.0	585.9	0.0	0.0	0.0
16	Pasture	6.2	0.0	0.0	0.0	6.3	-0.2	-0.2	-0.1	6.1	0.0	0.0	0.0
	Alfalfa	5.1	0.0	0.0	0.0	5.2	-0.1	-0.1	-0.1	5.1	0.0	0.0	0.0
	Other Field Crops	6.1	0.0	0.0	0.0	6.1	-0.1	-0.1	-0.1	6.0	0.0	0.0	0.0
	Truck Crops	5.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0
	Deciduous Orchard	16.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0
	Small Grain	4.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	4.0	0.0	0.0	0.0
	Grapes	55.0	0.0	0.0	0.0	55.0	0.0	0.0	0.0	55.0	0.0	0.0	0.0
	Cotton	5.0	0.0	0.0	0.0	5.1	0.0	0.0	0.0	5.0	0.0	0.0	0.0
	Subtropical Orchard	9.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0
	Subtotal	111.4	-0.1	-0.1	0.0	111.8	-0.4	-0.4	-0.4	111.3	-0.1	-0.1	-0.1
17	Pasture	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0
	Alfalfa	5.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0
	Sugar Beets	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Other Field Crops	8.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0
	Truck Crops	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
	Tomatoes	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	Deciduous Orchard	73.0	0.0	0.0	0.0	73.0	0.0	0.0	0.0	73.0	0.0	0.0	0.0
	Small Grain	6.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0
	Grapes	109.0	0.0	0.0	0.0	109.0	0.0	0.0	0.0	109.0	0.0	0.0	0.0
	Cotton	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0
	Subtropical Orchard	35.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0
Subtotal		260.1	0.0	0.0	0.0	260.3	0.0	0.0	0.0	255.3	0.0	0.0	0.0

18	Pasture	4.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	3.7	0.0	0.0	0.0
	Alfalfa	62.2	0.0	0.0	0.1	62.8	-0.3	-0.3	-0.2	59.0	0.0	0.0	0.0
	Sugar Beets	1.9	0.0	0.0	0.0	1.9	0.0	0.0	0.0	1.9	0.0	0.0	0.0
	Other Field Crops	78.1	0.0	0.0	-0.1	78.5	-0.2	-0.2	-0.2	75.3	0.0	0.0	0.0
	Truck Crops	13.0	0.0	0.0	0.0	13.0	0.0	0.0	0.0	13.0	0.0	0.0	0.0
	Tomatoes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Deciduous Orchard	69.0	0.0	0.0	0.0	69.0	0.0	0.0	0.0	69.0	0.0	0.0	0.0
	Small Grain	41.0	0.0	0.0	0.0	41.4	-0.1	-0.1	-0.1	38.8	0.1	0.1	0.1
	Grapes	56.0	0.0	0.0	0.0	56.0	0.0	0.0	0.0	56.0	0.0	0.0	0.0
	Cotton	170.3	0.0	0.0	-0.1	171.2	-0.5	-0.5	-0.5	163.7	0.0	0.0	0.1
	Subtropical Orchard	97.0	0.0	0.0	0.0	97.0	0.0	0.0	0.0	97.0	0.0	0.0	0.0
Subtotal		592.5	0.0	0.0	-0.1	594.9	-1.2	-1.2	-1.2	577.2	0.1	0.1	0.1
19	Pasture	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alfalfa	25.8	0.0	0.0	0.0	25.9	0.0	0.0	0.0	25.2	0.0	0.0	0.0
	Sugar Beets	4.9	0.0	0.0	0.0	5.0	0.0	0.0	0.0	4.9	0.0	0.0	0.0
	Other Field Crops	6.7	0.0	0.0	0.0	6.7	0.0	0.0	0.0	6.7	0.0	0.0	0.0
	Truck Crops	24.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0
	Tomatoes	1.7	0.0	0.0	0.0	1.7	0.0	0.0	0.0	1.7	0.0	0.0	0.0
	Deciduous Orchard	50.9	0.0	0.0	0.0	50.9	0.0	0.0	0.0	50.9	0.0	0.0	0.0
	Small Grain	7.6	0.0	0.0	0.0	7.6	0.0	0.0	0.0	7.2	0.0	0.0	0.0
	Grapes	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
	Cotton	117.9	0.0	0.0	-0.1	117.8	0.0	0.0	0.0	115.1	0.0	0.0	0.0
	Subtropical Orchard	4.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0
Subtotal		253.6	0.0	0.0	0.0	253.6	0.0	0.0	0.0	249.7	0.0	0.0	0.0
20	Pasture	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alfalfa	12.0	0.0	0.0	0.0	12.1	0.0	0.0	0.0	11.0	0.0	0.0	0.0
	Sugar Beets	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0
	Other Field Crops	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0
	Truck Crops	41.0	0.0	0.0	0.0	41.0	0.0	0.0	0.0	40.9	0.0	0.0	0.0
	Tomatoes	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0
	Deciduous Orchard	52.0	0.0	0.0	0.0	52.0	0.0	0.0	0.0	52.0	0.0	0.0	0.0
	Small Grain	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0
	Grapes	33.0	0.0	0.0	0.0	33.0	0.0	0.0	0.0	33.0	0.0	0.0	0.0
	Cotton	33.0	0.0	0.0	0.0	33.1	0.0	0.0	0.0	30.8	0.0	0.0	0.0
	Subtropical Orchard	27.0	0.0	0.0	0.0	27.0	0.0	0.0	0.0	27.0	0.0	0.0	0.0
Subtotal		202.8	0.0	0.0	0.0	203.0	0.0	0.0	0.0	199.3	0.0	0.0	0.0

TABLE 18 VALUE OF PRODUCTION BY SUBREGION (Million \$)

CVPM Subregion	Crop Category	Preferred Alternative	Changes Compared to Average P.			Preferred Alternative	Changes Compared to Wet PA			Preferred Alternative	Changes Compared to Dry PA		
			Average	Wet	Dry		Average	Wet	Dry		Average	Wet	Dry
			Followed by Average				Followed by Wet				Followed by Dry		
1	Pasture	2.7	-0.2	0.0	0.0	2.6	-0.2	-0.2	-0.2	2.6	-0.3	-0.3	-0.3
	Alfalfa	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0
	Other Field Crops	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0
	Deciduous Orchard	4.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0
	Small Grain	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0
	Subtotal	8.4	-0.2	-0.1	0.0	8.3	-0.3	-0.3	-0.3	8.3	-0.3	-0.3	-0.3
2	Pasture	4.9	0.0	0.0	-0.5	4.9	0.0	0.0	-0.8	4.8	0.0	0.0	0.0
	Alfalfa	5.1	0.0	0.0	-0.2	5.1	0.0	0.0	-0.3	5.0	0.0	0.0	0.0
	Sugar Beets	2.9	0.0	0.0	0.0	2.9	0.0	0.0	0.0	2.9	0.0	0.0	0.0
	Other Field Crops	7.8	0.0	0.0	-0.2	7.8	0.0	0.0	-0.3	7.7	0.0	0.0	0.0
	Rice	3.8	0.0	0.0	-0.1	3.8	0.0	0.0	-0.3	3.8	0.0	0.0	0.0
	Truck Crops	55.1	0.0	0.0	-0.1	55.1	0.0	0.0	-0.1	55.1	0.0	0.0	0.0
	Deciduous Orchard	91.3	0.0	0.0	-0.1	91.3	0.0	0.0	0.0	91.3	0.0	0.0	0.0
	Small Grain	4.0	0.0	0.0	-0.1	3.9	0.0	0.0	-0.2	3.9	0.0	0.0	0.0
	Subtropical Orchard	14.6	0.0	0.0	0.0	14.6	0.0	0.0	0.0	14.6	0.0	0.0	0.0
	Subtotal	189.5	0.0	0.0	-1.3	189.4	0.0	0.0	-2.1	189.1	0.0	0.0	0.0
3	Pasture	1.1	0.0	0.0	0.0	1.1	0.0	0.0	0.0	1.1	0.0	0.0	0.0
	Alfalfa	9.7	0.0	0.0	0.0	9.7	0.0	0.0	0.0	9.6	0.0	0.0	0.0
	Sugar Beets	7.3	0.0	0.0	0.0	7.3	0.0	0.0	0.0	7.2	0.0	0.0	0.0
	Other Field Crops	7.1	0.0	0.0	0.0	7.1	0.0	0.0	0.0	7.0	0.0	0.0	0.0
	Rice	118.1	0.0	0.0	0.0	118.6	0.0	0.0	0.0	116.2	0.0	0.0	0.0
	Truck Crops	89.6	0.0	0.0	0.0	89.6	0.0	0.0	0.0	89.6	0.0	0.0	0.0
	Tomatoes	37.9	0.0	0.0	0.0	38.0	0.0	0.0	0.0	37.9	0.0	0.0	0.0
	Deciduous Orchard	18.9	0.0	0.0	0.0	18.9	0.0	0.0	0.0	18.9	0.0	0.0	0.0
	Small Grain	8.7	0.0	0.0	0.0	8.7	0.0	0.0	0.0	8.5	0.0	0.0	0.0
	Subtotal	298.4	0.0	0.0	0.0	299.0	0.0	0.0	0.0	295.9	0.0	0.0	0.0
3B	Pasture	0.8	0.0	0.0	-0.8	0.8	0.0	0.0	-0.2	0.6	0.0	0.0	0.0
	Alfalfa	5.4	0.0	0.0	-5.4	5.4	0.0	0.0	-1.4	4.1	0.0	0.0	0.0
	Sugar Beets	4.1	0.0	0.0	-3.9	4.1	0.0	0.0	-2.0	3.8	0.0	0.0	0.0
	Other Field Crops	6.1	0.0	0.0	-6.0	6.1	0.0	0.0	-6.1	4.7	0.0	0.0	0.0
	Rice	8.2	0.0	0.0	-8.2	8.2	0.0	0.0	-8.2	5.2	0.0	0.0	0.0
	Truck Crops	2.0	0.0	0.0	-0.2	2.0	0.0	0.0	-0.1	2.0	0.0	0.0	0.0
	Tomatoes	8.9	0.0	0.0	-5.6	8.9	0.0	0.0	-2.7	8.4	0.0	0.0	0.0
	Deciduous Orchard	28.6	0.0	0.0	-3.5	28.6	0.0	0.0	0.0	28.6	0.0	0.0	0.0
	Small Grain	2.4	0.0	0.0	-2.4	2.4	0.0	0.0	-2.4	1.8	0.0	0.0	0.0
	Subtropical Orchard	1.4	0.0	0.0	-0.1	1.4	0.0	0.0	0.0	1.4	0.0	0.0	0.0
	Subtotal	67.9	0.0	0.0	-36.2	68.1	0.1	0.1	-23.1	60.5	0.0	0.0	0.0

4	Pasture	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0
	Alfalfa	3.6	0.0	0.0	0.0	3.7	0.0	0.0	0.0	3.6	0.0	0.0	0.0
	Sugar Beets	7.5	0.0	0.0	0.0	7.5	0.0	0.0	0.0	7.5	0.0	0.0	0.0
	Other Field Crops	18.0	0.0	0.0	0.0	18.1	0.0	0.0	0.0	17.9	0.0	0.0	0.0
	Rice	74.6	0.0	0.0	0.0	74.8	0.0	0.0	0.0	74.1	0.0	0.0	0.0
	Truck Crops	60.8	0.0	0.0	0.0	60.8	0.0	0.0	0.0	60.8	0.0	0.0	0.0
	Tomatoes	49.9	0.0	0.0	0.0	49.9	0.0	0.0	0.0	49.9	0.0	0.0	0.0
	Deciduous Orchard	32.5	0.0	0.0	0.0	32.5	0.0	0.0	0.0	32.5	0.0	0.0	0.0
	Small Grain	13.5	0.0	0.0	0.0	13.5	0.0	0.0	0.0	13.3	0.0	0.0	0.0
	Subtotal	260.7	0.0	0.0	0.0	260.9	0.0	0.0	0.0	259.7	0.0	0.0	0.0
5	Pasture	3.1	0.0	0.0	0.0	3.1	0.0	0.0	0.0	3.0	0.0	0.0	0.0
	Alfalfa	2.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0
	Sugar Beets	1.5	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.5	0.0	0.0	0.0
	Other Field Crops	6.9	0.0	0.0	0.0	6.9	0.0	0.0	0.0	6.9	0.0	0.0	0.0
	Rice	141.2	0.0	0.0	0.0	141.7	-0.1	-0.1	-0.1	140.5	-0.1	-0.1	-0.1
	Truck Crops	23.5	0.0	0.0	0.0	23.5	0.0	0.0	0.0	23.5	0.0	0.0	0.0
	Tomatoes	2.3	0.0	0.0	0.0	2.3	0.0	0.0	0.0	2.3	0.0	0.0	0.0
	Deciduous Orchard	129.1	0.0	0.0	0.0	129.1	0.0	0.0	0.0	129.1	0.0	0.0	0.0
	Small Grain	6.3	0.0	0.0	0.0	6.3	0.0	0.0	0.0	6.2	0.0	0.0	0.0
	Subtropical Orchard	3.6	0.0	0.0	0.0	3.6	0.0	0.0	0.0	3.6	0.0	0.0	0.0
	Subtotal	320.0	0.0	0.0	0.0	320.5	-0.1	-0.1	-0.1	319.1	-0.1	-0.1	-0.1
6	Pasture	1.7	0.0	0.0	0.0	1.8	-0.1	-0.1	-0.1	1.7	0.0	0.0	0.0
	Alfalfa	16.8	0.0	0.0	0.0	17.0	-0.2	-0.2	-0.2	16.8	0.0	0.0	0.0
	Sugar Beets	16.2	0.0	0.0	0.0	16.3	-0.1	-0.1	0.0	16.2	0.0	0.0	0.0
	Other Field Crops	28.9	0.0	0.0	0.0	29.2	-0.2	-0.2	-0.2	28.8	0.0	0.0	0.0
	Rice	10.6	0.0	0.0	0.0	10.8	-0.2	-0.2	-0.2	10.5	0.0	0.0	0.0
	Truck Crops	14.1	0.0	0.0	0.0	14.1	0.0	0.0	0.0	14.1	0.0	0.0	0.0
	Tomatoes	70.0	0.0	0.0	0.0	70.2	-0.1	-0.1	-0.1	70.0	0.0	0.0	0.0
	Deciduous Orchard	26.2	0.0	0.0	0.0	26.2	0.0	0.0	0.0	26.2	0.0	0.0	0.0
	Small Grain	21.9	0.0	0.0	0.0	22.0	-0.1	-0.1	-0.1	21.5	0.1	0.1	0.1
	Grapes	13.8	0.0	0.0	0.0	13.8	0.0	0.0	0.0	13.8	0.0	0.0	0.0
	Subtotal	220.3	0.0	0.0	0.0	221.2	-0.9	-0.9	-0.9	219.6	0.0	0.0	0.0
7	Pasture	2.1	0.0	0.0	0.0	2.1	0.0	0.0	0.0	2.1	0.0	0.0	0.0
	Alfalfa	1.8	0.0	0.0	0.0	1.8	0.0	0.0	0.0	1.8	0.0	0.0	0.0
	Sugar Beets	1.9	0.0	0.0	0.0	1.9	0.0	0.0	0.0	1.9	0.0	0.0	0.0
	Other Field Crops	1.8	0.0	0.0	0.0	1.8	0.0	0.0	0.0	1.8	0.0	0.0	0.0
	Rice	39.6	0.0	0.0	0.0	39.7	0.0	0.0	0.0	39.3	0.0	0.0	0.0
	Truck Crops	1.2	0.0	0.0	0.0	1.2	0.0	0.0	0.0	1.2	0.0	0.0	0.0
	Tomatoes	0.8	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.8	0.0	0.0	0.0
	Deciduous Orchard	9.5	0.0	0.0	0.0	9.5	0.0	0.0	0.0	9.5	0.0	0.0	0.0
	Small Grain	3.2	0.0	0.0	0.0	3.2	0.0	0.0	0.0	3.1	0.0	0.0	0.0
	Grapes	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0
	Subtotal	62.3	0.0	0.0	0.0	62.4	0.0	0.0	0.0	61.9	0.0	0.0	0.0

8	Pasture	6.9	0.0	0.0	0.0	6.9	0.0	0.0	0.0	6.8	0.0	0.0	0.0
	Alfalfa	7.2	0.0	0.0	0.0	7.2	0.0	0.0	0.0	7.2	0.0	0.0	0.0
	Sugar Beets	9.8	0.0	0.0	0.0	9.8	0.0	0.0	0.0	9.8	0.0	0.0	0.0
	Other Field Crops	20.8	0.0	0.0	0.0	20.8	0.0	0.0	0.0	20.7	0.0	0.0	0.0
	Rice	3.7	0.0	0.0	0.0	3.7	0.0	0.0	0.0	3.7	0.0	0.0	0.0
	Truck Crops	70.9	0.0	0.0	0.0	70.9	0.0	0.0	0.0	70.9	0.0	0.0	0.0
	Tomatoes	19.8	0.0	0.0	0.0	19.8	0.0	0.0	0.0	19.7	0.0	0.0	0.0
	Deciduous Orchard	49.9	0.0	0.0	0.0	49.9	0.0	0.0	0.0	49.9	0.0	0.0	0.0
	Small Grain	9.2	0.0	0.0	0.0	9.2	0.0	0.0	0.0	8.9	0.0	0.0	0.0
	Grapes	101.7	0.0	0.0	0.0	101.7	0.0	0.0	0.0	101.7	0.0	0.0	0.0
Subtotal		299.9	0.0	0.0	0.0	300.0	0.0	0.0	0.0	299.3	0.0	0.0	0.0
9	Pasture	3.6	0.0	0.0	0.0	3.6	-0.1	-0.1	-0.1	3.4	0.1	0.1	0.1
	Alfalfa	25.6	-0.1	-0.1	0.0	25.7	-0.1	-0.1	-0.1	25.2	0.2	0.2	0.2
	Sugar Beets	22.0	0.0	0.0	0.0	22.0	0.0	0.0	0.0	21.9	0.1	0.1	0.1
	Other Field Crops	55.9	-0.1	-0.1	-0.1	56.0	-0.2	-0.2	-0.2	55.3	0.3	0.3	0.3
	Rice	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0
	Truck Crops	190.8	0.0	0.0	0.0	190.8	0.0	0.0	0.0	190.6	0.1	0.1	0.1
	Tomatoes	64.9	0.0	0.0	0.0	65.0	-0.1	-0.1	0.0	64.8	0.1	0.1	0.1
	Deciduous Orchard	22.7	0.0	0.0	0.0	22.7	0.0	0.0	0.0	22.7	0.0	0.0	0.0
	Small Grain	30.7	0.0	0.0	0.0	30.9	-0.1	-0.1	-0.1	29.7	0.3	0.3	0.3
	Grapes	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Subtotal		426.8	-0.3	-0.3	-0.1	427.2	-0.6	-0.6	-0.6	424.2	1.2	1.2	1.2
10	Pasture	3.1	0.0	0.0	0.0	3.1	0.0	0.0	0.0	3.1	0.0	0.0	0.0
	Alfalfa	23.6	0.0	0.0	-0.2	23.6	-0.1	0.0	-0.1	23.6	0.0	0.0	0.0
	Sugar Beets	12.2	0.0	0.0	0.0	12.2	0.0	0.0	0.0	12.2	0.0	0.0	0.0
	Other Field Crops	31.0	0.0	0.0	-0.1	31.0	0.0	0.0	0.0	31.0	0.0	0.0	0.0
	Rice	2.3	0.0	0.0	0.0	2.3	0.0	0.0	0.0	2.3	0.0	0.0	0.0
	Truck Crops	718.0	0.0	0.0	0.0	717.9	0.1	0.0	0.1	718.1	0.0	0.0	0.0
	Tomatoes	60.1	0.0	0.0	0.0	60.1	0.0	0.0	0.0	60.1	0.0	0.0	0.0
	Deciduous Orchard	52.4	0.0	0.0	0.0	52.4	0.0	0.0	0.0	52.4	0.0	0.0	0.0
	Small Grain	7.6	0.0	0.0	0.0	7.5	0.1	0.0	0.1	7.6	0.0	0.0	0.0
	Grapes	1.9	0.0	0.0	0.0	1.9	0.0	0.0	0.0	1.9	0.0	0.0	0.0
	Cotton	102.6	0.0	0.0	-0.5	102.7	-0.1	0.0	-0.1	102.6	0.0	0.0	0.0
	Subtropical Orchard	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0
Subtotal		1015.1	0.0	0.0	-0.8	1015.1	0.0	0.0	0.0	1015.2	0.0	0.0	0.0
11	Pasture	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	9.9	0.0	0.0	0.0
	Alfalfa	4.8	0.0	0.0	0.0	4.8	0.0	0.0	0.0	4.8	0.0	0.0	0.0
	Sugar Beets	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0
	Other Field Crops	11.5	0.0	0.0	0.0	11.5	0.0	0.0	0.0	11.4	0.0	0.0	0.0
	Rice	3.5	0.0	0.0	0.0	3.6	0.0	0.0	0.0	3.5	0.0	0.0	0.0
	Truck Crops	40.1	0.0	0.0	0.0	40.1	0.0	0.0	0.0	40.0	0.0	0.0	0.0
	Tomatoes	1.2	0.0	0.0	0.0	1.2	0.0	0.0	0.0	1.2	0.0	0.0	0.0
	Deciduous Orchard	115.8	0.0	0.0	0.0	115.8	0.0	0.0	0.0	115.8	0.0	0.0	0.0
	Small Grain	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	Grapes	19.4	0.0	0.0	0.0	19.4	0.0	0.0	0.0	19.4	0.0	0.0	0.0
Subtotal		207.6	0.0	0.0	0.0	207.6	0.0	0.0	0.0	207.5	0.0	0.0	0.0

12	Pasture	4.2	0.0	0.0	0.0	4.2	0.0	0.0	0.0	4.2	0.0	0.0	0.0
	Alfalfa	10.5	0.0	0.0	0.0	10.4	0.0	0.0	0.0	10.5	0.0	0.0	0.0
	Sugar Beets	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Other Field Crops	26.5	0.0	0.0	0.0	26.4	0.0	0.0	0.0	26.3	0.0	0.0	0.0
	Truck Crops	19.1	0.0	0.0	0.0	19.1	0.0	0.0	0.0	19.1	0.0	0.0	0.0
	Deciduous Orchard	134.7	0.0	0.0	0.0	134.7	0.0	0.0	0.0	134.7	0.0	0.0	0.0
	Small Grain	5.4	0.0	0.0	0.0	5.4	0.0	0.0	0.0	5.3	0.0	0.0	0.0
	Grapes	26.2	0.0	0.0	0.0	26.2	0.0	0.0	0.0	26.2	0.0	0.0	0.0
	Cotton	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	Subtropical Orchard	3.5	0.0	0.0	0.0	3.5	0.0	0.0	0.0	3.5	0.0	0.0	0.0
Subtotal		231.2	0.0	0.0	0.0	230.9	0.0	0.0	0.0	230.8	0.0	0.0	0.0
13	Pasture	9.2	0.0	0.0	0.0	9.3	-0.1	-0.1	-0.1	9.2	-0.1	-0.1	-0.1
	Alfalfa	24.2	0.0	0.0	0.0	24.3	-0.1	-0.1	-0.1	24.2	-0.1	-0.1	-0.1
	Sugar Beets	4.4	0.0	0.0	0.0	4.4	0.0	0.0	0.0	4.4	0.0	0.0	0.0
	Other Field Crops	35.2	0.0	0.0	0.0	35.4	-0.1	-0.1	-0.1	35.1	-0.1	-0.1	-0.1
	Rice	3.1	0.0	0.0	0.0	3.1	0.0	0.0	0.0	3.1	0.0	0.0	0.0
	Truck Crops	114.4	0.0	0.0	0.0	114.4	0.0	0.0	0.0	114.4	0.0	0.0	0.0
	Tomatoes	10.5	0.0	0.0	0.0	10.5	0.0	0.0	0.0	10.5	0.0	0.0	0.0
	Deciduous Orchard	193.4	0.0	0.0	0.0	193.4	0.0	0.0	0.0	193.4	0.0	0.0	0.0
	Small Grain	25.3	0.0	0.0	0.0	25.4	0.0	0.0	-0.1	25.0	0.0	0.0	0.0
	Grapes	184.9	0.0	0.0	0.0	184.9	0.0	0.0	0.0	184.9	0.0	0.0	0.0
	Cotton	71.4	0.0	0.0	-0.1	71.8	-0.2	-0.2	-0.3	71.2	-0.2	-0.2	-0.2
	Subtropical Orchard	34.7	0.0	0.0	0.0	34.7	0.0	0.0	0.0	34.7	0.0	0.0	0.0
Subtotal		710.6	0.0	0.0	0.0	711.5	-0.5	-0.5	-0.7	709.9	-0.6	-0.6	-0.6
14	Pasture	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alfalfa	8.6	0.0	0.0	0.0	8.6	0.0	0.0	0.0	8.2	0.0	0.0	0.0
	Sugar Beets	3.9	0.0	0.0	0.0	4.0	0.0	0.0	0.0	3.9	0.0	0.0	0.0
	Other Field Crops	11.0	0.0	0.0	0.0	10.9	0.0	0.0	0.0	10.7	0.0	0.0	0.0
	Truck Crops	817.9	0.0	0.0	0.0	817.8	0.0	0.0	0.0	816.9	0.0	0.0	0.0
	Tomatoes	114.6	0.0	0.0	0.1	114.6	0.0	0.0	0.0	113.3	0.0	0.0	0.0
	Deciduous Orchard	38.5	0.0	0.0	0.0	38.5	0.0	0.0	0.0	38.5	0.0	0.0	0.0
	Small Grain	5.2	0.0	0.0	0.0	5.2	0.0	0.0	0.0	4.9	0.0	0.0	0.0
	Grapes	15.1	0.0	0.0	0.0	15.1	0.0	0.0	0.0	15.1	0.0	0.0	0.0
	Cotton	234.6	0.0	0.0	-0.1	234.7	0.0	0.0	0.0	225.8	0.0	0.0	0.0
	Subtropical Orchard	3.7	0.0	0.0	0.0	3.7	0.0	0.0	0.0	3.7	0.0	0.0	0.0
Subtotal		1253.1	0.0	0.0	0.0	1253.1	0.0	0.0	0.0	1241.1	0.0	0.0	0.0

15	Pasture	0.9	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.9	0.0	0.0	0.0
	Alfalfa	51.3	0.0	0.0	0.1	51.4	0.0	0.0	0.0	49.7	0.0	0.0	0.0
	Sugar Beets	4.1	0.0	0.0	0.0	4.1	0.0	0.0	0.0	4.0	0.0	0.0	0.0
	Other Field Crops	51.2	0.0	0.0	0.0	51.3	0.0	0.0	0.0	50.2	0.0	0.0	0.0
	Rice	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Truck Crops	72.0	0.0	0.0	0.0	72.0	0.0	0.0	0.0	71.9	0.0	0.0	0.0
	Tomatoes	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0
	Deciduous Orchard	58.7	0.0	0.0	0.0	58.7	0.0	0.0	0.0	58.7	0.0	0.0	0.0
	Small Grain	41.6	0.0	0.0	0.0	41.9	0.0	0.0	0.0	39.7	0.0	0.0	0.0
	Grapes	121.7	0.0	0.0	0.0	121.7	0.0	0.0	0.0	121.7	0.0	0.0	0.0
	Cotton	275.0	0.0	0.0	-0.2	275.7	0.0	0.0	-0.1	267.5	0.0	0.0	0.0
	Subtropical Orchard	3.7	0.0	0.0	0.0	3.7	0.0	0.0	0.0	3.7	0.0	0.0	0.0
	Subtotal	683.2	0.0	0.0	-0.1	684.5	0.0	0.0	0.0	671.1	0.0	0.0	0.0
16	Pasture	1.4	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.4	0.0	0.0	0.0
	Alfalfa	3.1	0.0	0.0	0.0	3.2	0.0	0.0	0.0	3.1	0.0	0.0	0.0
	Other Field Crops	3.6	0.0	0.0	0.0	3.6	0.0	0.0	0.0	3.6	0.0	0.0	0.0
	Truck Crops	30.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0
	Deciduous Orchard	24.7	0.0	0.0	0.0	24.7	0.0	0.0	0.0	24.7	0.0	0.0	0.0
	Small Grain	2.4	0.0	0.0	0.0	2.4	0.0	0.0	0.0	2.3	0.0	0.0	0.0
	Grapes	119.6	0.0	0.0	0.0	119.6	0.0	0.0	0.0	119.6	0.0	0.0	0.0
	Cotton	5.7	0.0	0.0	0.0	5.8	-0.1	-0.1	-0.1	5.7	0.0	0.0	0.0
	Subtropical Orchard	33.7	0.0	0.0	0.0	33.7	0.0	0.0	0.0	33.7	0.0	0.0	0.0
	Subtotal	224.3	0.0	0.0	0.0	224.5	-0.2	-0.2	-0.2	224.2	0.0	0.0	0.0
17	Pasture	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.5	0.0	0.0	0.0
	Alfalfa	3.1	0.0	0.0	0.0	3.1	0.0	0.0	0.0	2.5	0.0	0.0	0.0
	Sugar Beets	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Other Field Crops	4.8	0.0	0.0	0.0	4.8	0.0	0.0	0.0	4.2	0.0	0.0	0.0
	Truck Crops	60.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	59.7	0.0	0.0	0.0
	Tomatoes	1.5	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.4	0.0	0.0	0.0
	Deciduous Orchard	112.8	0.0	0.0	0.0	112.8	0.0	0.0	0.0	112.8	0.0	0.0	0.0
	Small Grain	3.5	0.0	0.0	0.0	3.5	0.0	0.0	0.0	3.1	0.0	0.0	0.0
	Grapes	236.9	0.0	0.0	0.0	236.9	0.0	0.0	0.0	236.9	0.0	0.0	0.0
	Cotton	11.4	0.0	0.0	0.0	11.4	0.0	0.0	0.0	9.9	0.0	0.0	0.0
	Subtropical Orchard	131.0	0.0	0.0	0.0	131.0	0.0	0.0	0.0	131.0	0.0	0.0	0.0
	Subtotal	565.7	0.0	0.0	0.0	565.7	0.0	0.0	0.0	562.0	0.0	0.0	0.0

18	Pasture	0.9	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.8	0.0	0.0	0.0
	Alfalfa	38.4	0.0	0.0	0.1	38.7	-0.2	-0.2	-0.2	36.4	0.0	0.0	0.0
	Sugar Beets	1.6	0.0	0.0	0.0	1.6	0.0	0.0	0.0	1.5	0.0	0.0	0.0
	Other Field Crops	46.5	0.0	0.0	0.0	46.7	-0.1	-0.1	-0.1	44.8	0.0	0.0	0.0
	Truck Crops	78.0	0.0	0.0	0.0	78.0	0.0	0.0	0.0	77.9	0.0	0.0	0.0
	Tomatoes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Deciduous Orchard	106.6	0.0	0.0	0.0	106.6	0.0	0.0	0.0	106.6	0.0	0.0	0.0
	Small Grain	24.0	0.0	0.0	0.0	24.3	-0.1	-0.1	-0.1	22.7	0.1	0.1	0.1
	Grapes	121.7	0.0	0.0	0.0	121.7	0.0	0.0	0.0	121.7	0.0	0.0	0.0
	Cotton	193.5	0.0	0.0	-0.1	194.6	-0.6	-0.6	-0.6	186.0	0.0	0.0	0.0
	Subtropical Orchard	363.1	0.0	0.0	0.0	363.1	0.0	0.0	0.0	363.1	0.0	0.0	0.0
	Subtotal	974.2	0.0	0.0	-0.1	976.1	-1.0	-1.0	-1.0	961.5	0.1	0.1	0.1
19	Pasture	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alfalfa	15.7	0.0	0.0	0.0	15.7	0.0	0.0	0.0	15.3	0.0	0.0	0.0
	Sugar Beets	4.3	0.0	0.0	0.0	4.3	0.0	0.0	0.0	4.2	0.0	0.0	0.0
	Other Field Crops	4.5	0.0	0.0	0.0	4.5	0.0	0.0	0.0	4.5	0.0	0.0	0.0
	Truck Crops	147.1	0.0	0.0	0.0	147.0	0.0	0.0	0.0	147.0	0.0	0.0	0.0
	Tomatoes	2.7	0.0	0.0	0.0	2.7	0.0	0.0	0.0	2.7	0.0	0.0	0.0
	Deciduous Orchard	80.2	0.0	0.0	0.0	80.2	0.0	0.0	0.0	80.2	0.0	0.0	0.0
	Small Grain	3.6	0.0	0.0	0.0	3.6	0.0	0.0	0.0	3.5	0.0	0.0	0.0
	Grapes	33.0	0.0	0.0	0.0	33.0	0.0	0.0	0.0	33.0	0.0	0.0	0.0
	Cotton	125.2	0.0	0.0	-0.1	125.1	0.0	0.0	0.0	122.2	0.0	0.0	0.0
	Subtropical Orchard	17.1	0.0	0.0	0.0	17.1	0.0	0.0	0.0	17.1	0.0	0.0	0.0
	Subtotal	433.3	0.0	0.0	0.0	433.3	0.0	0.0	0.0	429.7	0.0	0.0	0.0
20	Pasture	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alfalfa	7.3	0.0	0.0	0.0	7.3	0.0	0.0	0.0	6.7	0.0	0.0	0.0
	Sugar Beets	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0
	Other Field Crops	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0
	Truck Crops	251.6	0.0	0.0	0.0	251.6	0.0	0.0	0.0	251.2	0.0	0.0	0.0
	Tomatoes	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0
	Deciduous Orchard	81.8	0.0	0.0	0.0	81.8	0.0	0.0	0.0	81.8	0.0	0.0	0.0
	Small Grain	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.4	0.0	0.0	0.0
	Grapes	109.1	0.0	0.0	0.0	109.1	0.0	0.0	0.0	109.1	0.0	0.0	0.0
	Cotton	35.0	0.0	0.0	0.0	35.2	0.0	0.0	0.0	32.7	0.0	0.0	0.0
	Subtropical Orchard	115.6	0.0	0.0	0.0	115.6	0.0	0.0	0.0	115.6	0.0	0.0	0.0
	Subtotal	603.9	0.0	0.0	0.0	604.1	0.0	0.0	0.0	600.4	0.0	0.0	0.0

21	Pasture	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0
	Alfalfa	16.8	0.0	0.0	0.0	16.8	0.0	0.0	0.0	16.6	0.0	0.0	0.0
	Sugar Beets	6.4	0.0	0.0	0.0	6.4	0.0	0.0	0.0	6.3	0.0	0.0	0.0
	Other Field Crops	10.8	0.0	0.0	0.0	10.8	0.0	0.0	0.0	10.8	0.0	0.0	0.0
	Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Truck Crops	661.4	0.0	0.0	0.0	661.3	0.0	0.0	0.1	661.3	0.0	0.0	0.0
	Tomatoes	1.6	0.0	0.0	0.0	1.6	0.0	0.0	0.0	1.6	0.0	0.0	0.0
	Deciduous Orchard	39.3	0.0	0.0	0.0	39.3	0.0	0.0	0.0	39.3	0.0	0.0	0.0
	Small Grain	0.9	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.9	0.0	0.0	0.0
	Grapes	122.1	0.0	0.0	0.0	122.1	0.0	0.0	0.0	122.1	0.0	0.0	0.0
	Cotton	128.3	0.0	0.0	-0.1	128.3	0.0	0.0	0.0	126.7	0.0	0.0	0.0
	Subtropical Orchard	59.9	0.0	0.0	0.0	59.9	0.0	0.0	0.0	59.9	0.0	0.0	0.0
Subtotal		1047.6	0.0	0.0	0.0	1047.6	0.0	0.0	0.0	1045.7	0.0	0.0	0.0

NOTES:

1. All values in millions of 1992 dollars.
2. A negative value represents a lower gross revenue in an alternative than in the Preferred Alternative.
3. Not all 12 crops are grown in all subregions.
4. Subregions 3 and 3B should be added together to get the complete subregion 3. 3B represents the area within this subregion served by the Tehama Colusa Canal.

TABLE 19 CHANGES IN NET REVENUE BY SUBREGION (Million \$)

CVPM Subregion	Cause of Net Revenue Change		Change Compared to Average PA				Change Compared to Wet PA				Change Compared to Dry P		
			Average	Wet	Dry		Average	Wet	Dry		Average	Wet	Dry
			Followed By Average				Followed By Wet				Followed By Dry		
1	Fallowed Land	1.8	-0.1	0.0	0.0	1.8	-0.1	-0.1	-0.1	1.7	-0.1	-0.1	-0.1
	Groundwater Pumping Cost	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.1
	Irrigation Cost	2.3	-0.2	-0.2	-0.2	-2.3	-0.2	-0.2	-0.2	-2.3	-0.2	-0.2	-0.2
	CVP Water Cost	0.6	0.3	0.2	0.1	-0.7	0.4	0.4	0.4	-0.7	0.4	0.4	0.4
	Higher Crop Prices	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Net Change		0.1	0.0	0.0	-1.2	0.2	0.2	0.2	-1.2	0.2	0.2	0.2
2	Fallowed Land	30.1	0.0	0.0	-0.3	30.1	0.0	0.0	-0.4	30.0	0.0	0.0	0.0
	Groundwater Pumping Cost	20.4	0.0	0.0	0.0	-19.9	0.0	0.0	0.0	-24.6	0.0	0.0	0.0
	Irrigation Cost	22.1	0.0	0.0	0.0	-22.1	0.0	0.0	0.0	-21.9	0.0	0.0	0.0
	CVP Water Cost	0.4	-0.2	0.0	0.1	-0.6	-0.6	-0.2	0.5	-0.1	0.0	0.0	-0.1
	Higher Crop Prices	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0
	Net Change		-0.2	0.0	0.0	-12.4	-0.6	-0.2	0.1	-16.5	0.0	0.0	-0.1
3	Fallowed Land	39.3	0.0	0.0	0.0	39.4	0.0	0.0	0.0	38.9	0.0	0.0	0.0
	Groundwater Pumping Cost	9.0	0.0	0.0	0.0	-7.9	0.0	0.0	0.0	-14.5	0.0	0.0	0.0
	Irrigation Cost	21.2	0.0	0.0	0.0	-21.3	0.0	0.0	0.0	-21.0	0.0	0.0	0.0
	CVP Water Cost	1.6	0.0	0.0	0.0	-1.6	-0.2	-0.2	-0.2	-1.4	-0.3	-0.3	-0.3
	Higher Crop Prices	0.2	0.0	0.0	0.3	0.1	0.0	0.0	0.2	0.4	0.0	0.0	0.0
	Net Change		0.0	0.0	0.3	8.7	-0.2	-0.2	0.0	2.4	-0.3	-0.3	-0.3
3B	Fallowed Land	11.9	0.0	0.0	-6.4	11.9	0.0	0.0	-3.8	10.6	0.0	0.0	0.0
	Groundwater Pumping Cost	3.0	0.0	0.0	0.0	-1.8	1.4	1.4	-4.1	-8.3	0.0	0.0	0.0
	Irrigation Cost	9.0	0.0	0.0	0.0	-9.1	0.0	0.0	0.0	-7.7	0.0	0.0	0.0
	CVP Water Cost	3.7	-0.4	1.4	3.7	-4.2	-4.7	-1.2	4.2	-0.9	0.2	0.2	-0.3
	Higher Crop Prices	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Net Change		-0.4	1.4	-2.8	-3.1	-3.3	0.2	-3.7	-6.3	0.2	0.2	-0.3
4	Fallowed Land	34.3	0.0	0.0	0.0	34.3	0.0	0.0	0.0	34.1	0.0	0.0	0.0
	Groundwater Pumping Cost	9.3	0.0	0.0	0.0	-8.5	0.0	0.0	0.0	-13.5	0.0	0.0	0.0
	Irrigation Cost	20.2	0.0	0.0	0.0	-20.3	0.0	0.0	0.0	-20.1	0.0	0.0	0.0
	CVP Water Cost	1.3	0.0	0.0	0.0	-1.3	-0.1	-0.1	-0.1	-1.1	-0.2	-0.2	-0.2
	Higher Crop Prices	0.2	0.0	0.0	0.3	0.1	0.0	0.0	0.1	0.3	0.0	0.0	0.0
	Net Change		0.0	0.0	0.3	4.4	-0.1	-0.1	0.0	-0.3	-0.2	-0.2	-0.2
5	Fallowed Land	53.4	0.0	0.0	0.0	53.5	0.0	0.0	0.0	53.2	0.0	0.0	0.0
	Groundwater Pumping Cost	14.9	0.0	0.0	0.0	-13.0	0.0	0.0	0.0	-18.7	0.0	0.0	0.0
	Irrigation Cost	22.5	0.0	0.0	0.0	-22.6	0.0	0.0	0.0	-22.4	0.0	0.0	0.0
	CVP Water Cost	0.2	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3
	Higher Crop Prices	0.1	0.0	0.0	0.3	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0
	Net Change		-0.3	-0.3	0.0	17.7	-0.3	-0.3	-0.2	12.1	-0.3	-0.3	-0.3

6	Fallowed Land	32.3	0.0	0.0	0.0	32.5	-0.2	-0.2	-0.2	32.2	0.0	0.0	0.0
	Groundwater Pumping Cost	14.9	0.0	0.0	0.0	-14.4	0.3	0.3	0.3	-17.6	-0.1	-0.1	-0.1
	Irrigation Cost	21.6	0.0	0.0	0.0	-21.8	0.0	0.0	0.0	-21.5	0.0	0.0	0.0
	CVP Water Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Higher Crop Prices	0.3	0.0	0.0	0.4	0.2	0.0	0.0	0.2	0.5	0.0	0.0	0.0
	Net Change		0.0	0.0	0.4	-3.6	0.1	0.1	0.3	-6.4	-0.1	-0.1	-0.1
7	Fallowed Land	10.5	0.0	0.0	0.0	10.5	0.0	0.0	0.0	10.4	0.0	0.0	0.0
	Groundwater Pumping Cost	7.6	0.0	0.0	0.0	-6.9	0.0	0.0	0.0	-9.1	0.0	0.0	0.0
	Irrigation Cost	4.4	0.0	0.0	0.0	-4.4	0.0	0.0	0.0	-4.3	0.0	0.0	0.0
	CVP Water Cost	0.3	-0.1	-0.1	-0.1	-0.3	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1
	Higher Crop Prices	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
	Net Change		-0.1	-0.1	0.0	-1.0	-0.1	-0.1	0.0	-3.1	-0.1	-0.1	-0.1
8	Fallowed Land	46.4	0.0	0.0	0.0	46.5	0.0	0.0	0.0	46.4	0.0	0.0	0.0
	Groundwater Pumping Cost	30.8	0.0	0.0	0.0	-29.1	0.1	0.1	0.1	-35.4	-0.1	-0.1	-0.1
	Irrigation Cost	21.1	0.0	0.0	0.0	-21.1	0.0	0.0	0.0	-21.0	0.0	0.0	0.0
	CVP Water Cost	0.3	-0.8	-0.5	-1.6	-0.5	-2.0	-1.2	-2.8	-0.1	-0.3	-0.3	-0.4
	Higher Crop Prices	0.2	0.0	0.0	0.2	0.2	0.0	0.0	0.1	0.3	0.0	0.0	0.0
	Net Change		-0.8	-0.5	-1.3	-4.1	-1.9	-1.0	-2.5	-9.8	-0.3	-0.3	-0.5
9	Fallowed Land	52.9	-0.1	-0.1	0.0	52.9	-0.1	-0.1	-0.1	52.4	0.2	0.2	0.2
	Groundwater Pumping Cost	2.5	-0.6	-0.6	-0.6	-2.1	-1.2	-1.2	-1.2	-3.2	-0.4	-0.4	-0.4
	Irrigation Cost	34.4	-0.3	-0.3	-0.3	-34.4	-0.3	-0.3	-0.3	-33.9	-0.3	-0.3	-0.3
	CVP Water Cost	1.2	1.2	1.2	1.2	-2.0	2.0	2.0	2.0	-0.5	0.5	0.5	0.5
	Higher Crop Prices	0.3	0.0	0.0	0.5	0.3	0.0	0.0	0.2	0.6	0.0	0.0	0.0
	Net Change		0.3	0.3	0.7	14.5	0.5	0.5	0.7	15.5	0.0	0.0	0.0
10	Fallowed Land	97.8	0.0	0.0	-0.1	97.8	0.0	0.0	0.0	97.8	0.0	0.0	0.0
	Groundwater Pumping Cost	15.4	0.0	0.0	-6.8	-12.5	-8.3	-0.8	-8.6	-20.6	0.0	0.0	0.0
	Irrigation Cost	38.9	0.0	0.0	0.0	-38.9	0.0	0.0	0.0	-38.9	0.0	0.0	0.0
	CVP Water Cost	6.3	-0.1	0.4	6.3	-8.1	7.9	0.7	8.1	-3.2	0.2	0.2	-0.1
	Higher Crop Prices	0.5	0.0	0.0	0.4	0.4	0.0	0.0	0.2	0.9	0.0	0.0	0.0
	Net Change		-0.1	0.4	-0.1	38.7	-0.5	0.0	-0.3	36.0	0.2	0.2	-0.1
11	Fallowed Land	35.5	0.0	0.0	0.0	35.5	0.0	0.0	0.0	35.4	0.0	0.0	0.0
	Groundwater Pumping Cost	1.0	0.0	0.0	0.0	-0.8	0.0	0.0	0.0	-1.1	0.0	0.0	0.0
	Irrigation Cost	16.0	0.0	0.0	0.0	-16.0	0.0	0.0	0.0	-16.0	0.0	0.0	0.0
	CVP Water Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Higher Crop Prices	0.1	0.0	0.0	0.3	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0
	Net Change		0.0	0.0	0.3	18.7	0.0	0.0	0.1	18.6	0.0	0.0	0.0
12	Fallowed Land	41.8	0.0	0.0	0.0	41.7	0.0	0.0	0.0	41.7	0.0	0.0	0.0
	Groundwater Pumping Cost	6.1	0.0	0.0	0.0	-4.8	0.0	0.0	0.0	-8.4	0.0	0.0	0.0
	Irrigation Cost	19.9	0.0	0.0	0.0	-19.8	0.0	0.0	0.0	-19.8	0.0	0.0	0.0
	CVP Water Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Higher Crop Prices	0.1	0.0	0.0	0.3	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0
	Net Change		0.0	0.0	0.3	17.2	0.0	0.0	0.1	13.7	0.0	0.0	0.0

13	Fallowed Land	112.2	0.0	0.0	0.0	112.3	-0.1	-0.1	-0.1	112.1	-0.1	-0.1	-0.1
	Groundwater Pumping Cost	38.4	0.8	0.7	-2.7	-33.9	1.6	1.6	-4.9	-50.7	0.2	0.2	0.2
	Irrigation Cost	53.6	0.0	0.0	0.0	-53.8	0.0	0.0	0.0	-53.6	0.0	0.0	0.0
	CVP Water Cost	6.8	-0.8	-0.6	2.1	-6.4	-1.7	-1.5	4.3	-5.4	-0.2	-0.2	-0.4
	Higher Crop Prices	0.4	0.0	0.0	0.5	0.4	0.0	0.0	0.2	0.8	0.0	0.0	0.0
	Net Change		0.0	0.1	-0.1	18.7	-0.1	0.0	-0.5	3.3	-0.1	-0.1	-0.3
14	Fallowed Land	111.5	0.0	0.0	0.0	111.5	0.0	0.0	0.0	110.3	0.0	0.0	0.0
	Groundwater Pumping Cost	81.1	0.0	0.0	0.0	-58.3	0.0	0.0	0.0	-118.6	0.0	0.0	0.0
	Irrigation Cost	62.8	0.0	0.0	0.0	-62.8	0.0	0.0	0.0	-61.1	0.0	0.0	0.0
	CVP Water Cost	32.8	1.3	3.5	-6.0	-45.1	1.8	6.4	-5.5	-14.4	-6.3	-6.3	-7.3
	Higher Crop Prices	0.7	0.0	0.0	0.5	0.6	0.0	0.0	0.2	1.2	0.0	0.0	0.0
	Net Change		1.3	3.5	-5.6	-53.9	1.8	6.4	-5.3	-82.6	-6.3	-6.3	-7.3
15	Fallowed Land	94.1	0.0	0.0	0.0	94.2	0.0	0.0	0.0	92.6	0.0	0.0	0.0
	Groundwater Pumping Cost	81.0	0.0	0.0	0.0	-69.3	0.3	0.3	0.3	-102.9	-1.5	-1.5	-1.5
	Irrigation Cost	61.8	0.0	0.0	0.0	-61.9	0.0	0.0	0.0	-60.3	0.0	0.0	0.0
	CVP Water Cost	1.8	-0.3	-0.2	-0.4	-1.9	-0.2	-0.2	-0.3	-1.5	-0.4	-0.4	-0.5
	Higher Crop Prices	0.7	0.0	0.0	0.4	0.6	0.1	0.0	0.2	1.5	0.0	0.0	0.0
	Net Change		-0.3	-0.2	0.1	-38.3	0.2	0.2	0.2	-70.7	-1.9	-1.9	-1.9
16	Fallowed Land	37.3	0.0	0.0	0.0	37.3	0.0	0.0	0.0	37.3	0.0	0.0	0.0
	Groundwater Pumping Cost	1.9	-0.6	-0.6	-0.6	0.0	-0.5	-0.5	-0.5	-4.3	-0.5	-0.5	-0.5
	Irrigation Cost	11.0	0.0	0.0	0.0	-11.1	0.0	0.0	0.0	-11.0	0.0	0.0	0.0
	CVP Water Cost	0.7	0.7	0.7	0.7	-0.7	0.7	0.7	0.7	-0.5	0.5	0.5	0.5
	Higher Crop Prices	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0
	Net Change		0.0	0.0	0.1	25.7	0.1	0.1	0.1	21.6	0.0	0.0	0.0
17	Fallowed Land	95.8	0.0	0.0	0.0	95.8	0.0	0.0	0.0	95.2	0.0	0.0	0.0
	Groundwater Pumping Cost	17.7	0.2	0.2	0.2	-12.7	0.3	0.3	0.3	-25.5	0.0	0.0	0.0
	Irrigation Cost	27.8	0.0	0.0	0.0	-27.8	0.0	0.0	0.0	-27.4	0.0	0.0	0.0
	CVP Water Cost	1.4	-0.1	-0.1	-0.3	-1.2	-0.4	-0.3	-0.5	-1.1	0.0	0.0	-0.1
	Higher Crop Prices	0.2	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0
	Net Change		0.0	0.1	0.1	54.2	0.0	0.0	-0.1	41.5	0.0	0.0	-0.1
18	Fallowed Land	153.6	0.0	0.0	0.0	153.9	-0.1	-0.1	-0.1	151.9	0.0	0.0	0.0
	Groundwater Pumping Cost	57.9	0.0	0.0	0.0	-46.2	0.2	0.2	0.2	-78.0	0.0	0.0	0.0
	Irrigation Cost	64.9	0.0	0.0	0.0	-65.1	0.0	0.0	0.0	-63.2	0.0	0.0	0.0
	CVP Water Cost	17.7	-1.5	-1.0	-3.3	-17.7	-2.2	-1.7	-3.9	-15.2	0.8	0.8	0.0
	Higher Crop Prices	0.6	0.0	0.0	0.4	0.5	0.0	0.0	0.1	1.1	0.0	0.0	0.0
	Net Change		-1.5	-1.0	-2.9	25.3	-2.1	-1.6	-3.7	-3.4	0.8	0.8	0.0
19	Fallowed Land	54.3	0.0	0.0	0.0	54.3	0.0	0.0	0.0	53.9	0.0	0.0	0.0
	Groundwater Pumping Cost	31.6	0.0	0.0	0.0	-21.3	0.2	0.2	0.2	-51.5	-1.2	-1.2	-1.2
	Irrigation Cost	28.8	0.0	0.0	0.0	-28.8	0.0	0.0	0.0	-28.3	0.0	0.0	0.0
	CVP Water Cost	0.5	-0.5	-0.5	-0.6	-0.6	-0.5	-0.5	-0.5	-0.4	-0.5	-0.5	-0.5
	Higher Crop Prices	0.3	0.0	0.0	0.2	0.3	0.0	0.0	0.1	0.6	0.0	0.0	0.0
	Net Change		-0.5	-0.5	-0.3	3.9	-0.3	-0.3	-0.3	-25.7	-1.8	-1.8	-1.8

20	Fallowed Land	81.5	0.0	0.0	0.0	81.5	0.0	0.0	0.0	81.0	0.0	0.0	0.0
	Groundwater Pumping Cost	24.7	0.0	0.0	0.0	-19.7	0.0	0.0	0.0	-36.6	-0.2	-0.2	-0.2
	Irrigation Cost	20.9	0.0	0.0	0.0	-20.9	0.0	0.0	0.0	-20.5	0.0	0.0	0.0
	CVP Water Cost	9.2	-0.1	0.2	-0.9	-9.5	-0.3	-0.1	-1.1	-7.0	-0.2	-0.2	-0.5
	Higher Crop Prices	0.2	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.3	0.0	0.0	0.0
	Net Change		-0.1	0.2	-0.8	31.5	-0.3	0.0	-1.1	17.2	-0.3	-0.3	-0.7
21	Fallowed Land	112.4	0.0	0.0	0.0	112.4	0.0	0.0	0.0	112.1	0.0	0.0	0.0
	Groundwater Pumping Cost	49.3	0.0	0.0	0.0	-37.6	0.2	0.2	0.2	-68.4	-0.8	-0.8	-0.8
	Irrigation Cost	37.1	0.0	0.0	0.0	-37.1	0.0	0.0	0.0	-36.8	0.0	0.0	0.0
	CVP Water Cost	8.4	0.1	0.3	-0.5	-9.6	0.2	0.5	-0.4	-5.5	-0.7	-0.7	-0.9
	Higher Crop Prices	0.4	0.0	0.0	0.2	0.4	0.0	0.0	0.1	0.7	0.0	0.0	0.0
	Net Change		0.1	0.3	-0.3	28.5	0.4	0.7	-0.1	2.1	-1.5	-1.5	-1.7
Total	Fallowed Land		-0.1	0.0	-6.8	1100.4	-0.4	-0.3	-4.6	1093.0	-0.2	-0.2	-0.2
	Groundwater Pumping		0.4	0.4	-9.9	-364.0	-4.4	3.1	-16.6	-616.9	-4.0	-4.0	-4.0
	Irrigation Cost		-0.3	-0.3	-0.3	-503.5	-0.3	-0.3	-0.3	-496.0	-0.3	-0.3	-0.3
	CVP Water Cost		-1.3	4.3	2.3	-91.1	0.0	2.9	6.5	-42.5	-8.0	-7.9	-10.7
	Higher Crop Prices		0.1	0.0	4.7	4.1	0.4	0.4	1.9	8.6	0.0	0.0	0.0
	Net Change		-1.1	4.4	-10.0	146.0	-4.6	5.8	-13.2	-53.9	-12.4	-12.4	-15.1

Notes:

1. All values in millions of 1992 dollars
2. A negative value represents a reduction in net revenue compared to the Preferred Alternative
3. Subregions 3 and 3B should be added together to get the complete subregion 3. 3B represents the area within this subregion served by the Tehama Colusa Canal
4. PA is the Preferred Alternative

TABLE 20 IRRIGATION WATER APPLIED BY SUBREGION

CVPM Subregion	Water Source	Preferred Alternative Average	Changes Compared to Average PA			Preferred Alternative Wet	Changes Compared to Wet PA			Preferred Alternative Dry	Changes Compared to Dry PA		
			Average	Wet	Dry		Average	Wet	Dry		Average	Wet	Dry
			Followed by Average				Followed by Wet				Followed by Dry		
1	CVP Water	19.3	-10.8	-6.4	-5.4	20.5	-13.0	-13.0	-13.0	21.0	-13.5	-13.5	-13.5
	Groundwater	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	-1.5	-1.5	-1.5
2	CVP Water	27.7	0.0	0.0	-21.6	37.1	0.0	0.1	-36.7	8.2	0.0	0.0	0.0
	Groundwater	512.1	0.0	0.0	0.0	506.4	0.0	-0.1	0.0	584.7	0.0	0.0	0.0
3	CVP Water	170.4	0.0	0.0	0.0	174.2	0.0	0.0	0.0	154.3	0.0	0.0	0.0
	Groundwater	248.9	0.0	0.0	0.0	227.0	0.0	0.0	0.0	355.3	0.0	0.0	0.0
3B	CVP Water	199.6	0.1	0.0	-199.6	227.0	39.3	39.1	-227.0	50.3	0.0	0.0	-0.1
	Groundwater	78.7	-0.1	0.0	0.0	50.4	-38.4	-38.2	99.6	191.9	0.0	0.0	0.0
4	CVP Water	129.8	0.0	0.0	0.0	133.1	0.0	0.0	0.0	113.9	0.0	0.0	0.0
	Groundwater	326.6	0.0	0.0	0.0	305.1	0.0	0.0	0.0	442.8	0.0	0.0	0.0
5	CVP Water	19.9	0.1	0.0	0.1	20.8	0.1	0.0	0.0	17.9	0.0	-0.1	0.0
	Groundwater	492.6	-0.1	0.0	-0.1	449.3	-1.1	-1.0	-0.4	588.7	-1.1	-1.0	-1.1
6	CVP Water	2.2	0.0	0.0	0.0	2.4	0.0	0.0	0.0	1.8	0.0	0.0	0.0
	Groundwater	452.8	0.0	0.0	0.0	447.6	-6.4	-6.4	-6.0	521.0	0.0	0.0	0.0
7	CVP Water	22.0	0.0	0.0	0.0	22.6	0.0	0.0	0.0	19.1	0.0	0.0	0.0
	Groundwater	193.2	0.0	0.0	0.0	177.9	0.0	0.0	0.0	217.5	0.0	0.0	0.0
8	CVP Water	51.6	0.1	0.0	-0.1	79.4	0.1	-0.1	-0.1	25.3	0.0	0.0	-0.1
	Groundwater	756.4	-0.1	0.0	0.1	717.3	0.0	0.0	0.0	851.3	-0.2	-0.2	-0.1
9	CVP Water	28.2	-28.2	-28.2	-28.2	48.1	-48.1	-48.1	-48.1	11.5	-11.5	-11.5	-11.5
	Groundwater	80.3	17.9	17.9	18.7	70.2	35.6	35.6	36.0	100.1	11.5	11.5	11.4
10	CVP Water	183.4	0.0	0.0	-183.4	234.4	-228.4	-22.8	-234.4	92.1	0.0	0.0	0.0
	Groundwater	496.2	0.0	0.0	179.4	414.4	227.7	22.7	233.7	632.4	0.0	0.0	-0.1
11	CVP Water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Groundwater	34.1	0.0	0.0	0.0	26.8	0.0	0.0	0.0	34.5	0.0	0.0	0.0
12	CVP Water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Groundwater	173.1	0.0	0.0	0.0	141.8	0.0	0.0	0.0	228.2	0.0	0.0	0.0
13	CVP Water	163.6	16.7	16.6	-60.2	159.0	33.2	33.1	-113.1	128.2	0.0	0.0	0.0
	Groundwater	912.5	-16.7	-16.6	60.2	812.0	-36.2	-36.2	109.1	1,181.4	-3.8	-3.8	-3.8
14	CVP Water	524.4	0.1	0.0	0.1	719.0	0.1	0.0	0.0	230.2	0.0	0.0	0.0
	Groundwater	826.3	-0.1	0.0	-0.1	603.6	-0.1	0.0	0.0	1,176.4	0.0	0.0	0.0
15	CVP Water	35.1	0.0	0.1	0.1	38.1	0.0	0.1	0.0	28.6	0.0	0.0	0.0
	Groundwater	1,276.6	0.0	-0.1	-0.1	1,099.1	0.0	0.0	0.0	1,600.7	0.0	0.0	0.0
16	CVP Water	16.2	-16.2	-16.2	-16.2	15.7	-15.7	-15.7	-15.7	12.9	-12.9	-12.9	-12.9
	Groundwater	49.6	14.9	14.8	15.0	0.0	13.2	13.2	13.2	107.3	11.5	11.5	11.5
17	CVP Water	34.6	3.9	3.8	4.0	32.5	7.4	7.3	7.4	27.1	0.0	0.0	0.1
	Groundwater	415.1	-3.8	-3.8	-3.9	303.2	-7.4	-7.2	-7.4	577.4	0.0	0.0	0.0
18	CVP Water	517.3	0.0	0.0	0.1	526.3	0.0	0.0	0.1	399.0	0.0	0.0	0.1
	Groundwater	1,018.0	0.0	0.0	-0.1	821.8	-4.0	-4.0	-3.8	1,334.9	0.0	0.0	0.0
19	CVP Water	13.3	-0.1	0.0	0.1	15.4	-0.1	-0.1	0.0	9.4	0.0	0.0	0.0
	Groundwater	366.8	0.1	0.0	-0.1	250.7	0.0	0.0	0.0	578.4	0.0	0.0	0.0

20	CVP Water	208.7	0.1	0.1	-0.2	219.8	0.1	0.1	-0.1	154.1	0.0	0.0	-0.1
	Groundwater	303.6	-0.1	-0.1	0.1	244.8	0.0	0.0	0.0	437.3	0.0	0.0	0.0
21	CVP Water	138.3	0.0	0.0	-0.1	163.0	0.0	0.1	-0.1	89.3	0.0	0.0	-0.1
	Groundwater	579.4	0.0	0.0	0.1	445.2	0.0	-0.1	0.0	783.1	0.0	0.0	0.0
Total	CVP Water	2,505.5	-34.4	-30.4	-510.5	2,888.2	-224.9	-19.8	-680.6	1,593.9	-37.7	-37.8	-37.8
	Groundwater	9,596.5	11.9	12.3	269.2	8,114.6	182.8	-21.6	474.0	12,527.1	16.1	16.2	16.1

Notes:

1. All quantities in thousands of acre-feet
2. A negative value represents a lower quantity than in the Preferred Alternative
3. Subregions 3 and 3B should be added together to get the complete subregion 3. 3B represents the area within this subregion served by the Tehama Colusa Canal
4. PA is the Preferred Alternative

TABLE 21 SUBREGION ANALYSIS OF SIGNIFICANT CHANGES IN WATER USE

Subregion	Outcome	Explanation
1	Decrease in CVP use and no GW substitution in all sequences	Less CVP water is used than in the Preferred Alternative because the blended price is 140% to 330% higher than the Preferred Alternative Tier 1 (the only tier of water that was used for this scenario). For hydrologic reasons, subregion 1 is restricted from switching to groundwater.
2	Decrease in CVP use and no GW substitution in Dry to Average and Dry to Wet sequences	Less CVP water is used than in the Preferred Alternative because the blended prices for the Dry to Average and Dry to Wet sequences are 320% and 345% higher than the Preferred Alternative Tier 1 price (the only water tier that was used for this scenario). For hydrologic reasons, subregion 2 is restricted from switching to groundwater.
3B	Decrease CVP and no GW substitution in Dry to Average sequence	Less CVP water is used than in the Preferred Alternative because the blended price is 240% higher than the Tier 1 price from the Preferred Alternative, which is the only tier of water that was used. For hydrologic reasons the region is restricted from switching to groundwater in this long-run scenario.
3B	Decrease in CVP use and GW substitution in Dry to Wet sequence	CVP water use decreases because the blended price is 260% higher than the Preferred Alternative Tier 1 price. The model allowed a shift to groundwater on a short run basis to provide water to permanent crops during the wet year when groundwater would have been recharged.
3B	Shift from Groundwater to CVP water in Average to Wet and Wet to Wet sequences	In the Preferred Alternative wet year analysis subregion 3B has 39 TAF of water that falls in Tiers 2 or 3. Under the LTCR blended pricing mechanism all of the subregions CVP water is prices at a level that is lower than the Preferred Alternative Tier 2. This additional affordable CVP water is used resulting in a less groundwater being pumped.
9	Shift from CVP to Groundwater in all sequences	The blended price of CVP water in subregion 9 is greater than the groundwater pumping cost resulting in the shift from CVP to groundwater.
10	Shift from CVP to Groundwater in Dry to Average and Average, Wet and Dry to Wet sequences	Due to an increase in the CVP price relative to the Preferred Alternative, the depth to which groundwater can be affordable pumped increases resulting in the shift from CVP supplies to groundwater.
13	Shift from groundwater to CVP in Average to Average, Wet to Average, Average to Wet and Wet to Wet sequences	In the Preferred Alternative Average and Wet conditions subregion 13 had water classified as Tier 2 or Tier 3 which was not affordable, and pumped groundwater to supplement it's Tier 1 supply down to a depth at which it was no longer affordable. In the LTCR sequences, the blended price is less expensive than the Preferred Alternative upper Tier price, therefor a shift is made from the deepest groundwater to the now affordable CVP supply.
13	Shift from CVP to Groundwater in Dry to Average and Dry to Wet sequences	Under the LTCR blended price mechanism, when coming out of a drought into a Average or Wet year the blended price increases. In these situations, shallow groundwater is less expensive than the CVP blended price. As more groundwater is pumped the cost increases as the pump lift increases and the cost eventually becomes greater than the CVP blended price. When this happens the remainder of the subregions water supply is taken from the CVP supplies.

16	Shift from CVP to Groundwater in all sequences	The blended price of CVP water in subregion 16 is greater than the groundwater pumping cost resulting in the shift from CVP to groundwater.
17	Shift from groundwater to CVP	In the Preferred Alternative Average and Wet conditions this subregion had water classified as Tier 2 or Tier 3 which was not affordable. The subregion pumped groundwater down to a depth at which it was no longer affordable to supplement the CVP water is was able to afford. In the LTCR sequences, the blended price is less expensive than the least expensive CVP tier that was not used, therefor a shift is made from the deepest groundwater to the now affordable CVP supply.
19	Shift from CVP to Groundwater in Dry to Dry sequence	The blended pricing causes the Dry to Dry CVP water cost to rise higher than the groundwater pumping cost resulting in the shift from CVP to groundwater.

SECTION 2

REGIONAL ECONOMICS

REGIONAL ECONOMICS

This analysis identifies the regional economic impacts of two out of the nine total Long Term Contract Renewal sequences; an Average year following an Average 5-year base condition, and a Average year following a Dry 5-year base condition. The regional economic analysis is restricted to these sequences because they are the only sequences that represent long-run conditions. The Input-Output model used in the regional economic analysis assumes a long run equilibrium is reached, therefore it is inappropriate to model short run responses represented by the Wet and Dry year conditions. While the Average year following the Dry 5-year base condition is not strictly a long-run scenario, as described in the Agricultural and Land Use and Economics section, there are some regions that will be permanently impacted by a five year series of drought years. Because of this, the results can be considered long run.

The assumptions and baseline data used in this analysis are the same as what was used in the Preferred Alternative. Tables 23 and 24 show the results of the Average year following an Average 5-year base condition, Tables 25 and 26 the Average year following an Wet 5-year base condition, and Tables 27 and 28 the Average year following an Dry 5-year base condition. Tables 23, 25, and 27 present the impacts by economic sectors that are aggregations of SIC industries. Tables 24, 26, and 28 present the regional economic impacts broken out by the source of the impact including reduced agricultural output, changes in net farm income, and changes in M&I water costs. Note that regional economic impacts are not reported for the North Coast or the Central and South Coast regions because the rolling five year average tiered pricing mechanism has no impact on these regions.

AVERAGE YEAR FOLLOWING AVERAGE 5-YEAR BASE CONDITION

Table 23 shows the employment, output and income effects on all sectors in each regional economy of the long-term contract renewals. Most of the impacts are felt in the Manufacturing, Trade and Services sectors. These impacts are derived from the impact to net income. The economic impacts by region from each source can be seen in Table 24. Reduction in net income resulting from changes in CVP water cost, groundwater pumping, irrigation costs and changes in crop prices have the greatest impact at the statewide level.

AVERAGE YEAR FOLLOWING DRY 5-YEAR BASE CONDITION

Table 27 shows the employment, output and income effects for each regional economy and the State as a whole broken out by the impacted sectors. Table 28 shows how each of the impact sources contribute to the total impact. The reduction in agricultural output in the Sacramento River region relative to the Preferred Alternative dominates the Statewide impact.

TABLE 22

**REGIONAL ECONOMIC IMPACTS ON ALL SECTORS: AVERAGE YEAR FOLLOWING AVERAGE 5-YEAR
BASE CONDITION COMPARED TO THE PREFERRED ALTERNATIVE AVERAGE YEAR CONDITION**

Region Directly Impacted	Impacts on all Sectors					
	Employment (# of jobs)		Output (\$MM)		PoW Income (\$MM)	
	Direct	Total	Direct	Total	Direct	Total
Sacramento River						
Agriculture						
Reduced Output	-10	-20	-0.5	-1.2	-0.2	-0.6
Reduced Net Income	-20	-50	-0.9	-2.3	-0.5	-1.3
Total Agriculture	-30	-60	-1.4	-3.5	-0.7	-1.9
M&I Water Costs	-60	-130	-3.9	-8.5	-2.0	-4.7
TOTAL 1/	-90	-190	-5.3	-12.0	-2.8	-6.6
San Joaquin River						
Agriculture						
Reduced Output	0	0	-0.2	-0.3	-0.1	-0.2
Reduced Net Income	20	40	0.8	1.8	0.5	1.0
Total Agriculture	20	30	0.7	1.5	0.4	0.9
M&I Water Costs	-80	-150	-5.0	-9.4	-2.6	-5.1
TOTAL 1/	-60	-120	-4.3	-7.9	-2.2	-4.2
Tulare Lake						
Agriculture						
Reduced Output	0	0	0.0	0.0	0.0	0.0
Reduced Net Income	-50	-80	-2.1	-4.1	-1.1	-2.2
Total Agriculture	-50	-80	-2.1	-4.1	-1.1	-2.2
M&I Water Costs	0	0	0.0	0.0	0.0	0.0
TOTAL 1/	-50	-80	-2.1	-4.1	-1.1	-2.2
Bay Area						
Agriculture						
Reduced Output	0	0	0.0	0.0	0.0	0.0
Reduced Net Income	0	-10	-0.2	-0.4	-0.1	-0.2
Total Agriculture	0	-10	-0.2	-0.4	-0.1	-0.2
M&I Water Costs	-60	-130	-4.4	-9.4	-2.4	-5.4
TOTAL 1/	-60	-130	-4.6	-9.8	-2.5	-5.6
California Total						
Agriculture						
Reduced Output	-10	-20	-0.7	-1.5	-0.3	-0.8
Reduced Net Income	-50	-100	-2.3	-5.0	-1.2	-2.7
Total Agriculture	-60	-120	-3.0	-6.5	-1.6	-3.5
M&I Water Costs	-200	-410	-13.3	-27.4	-7.0	-15.1
TOTAL 1/	-260	-530	-16.3	-33.9	-8.6	-18.6

Note: (1) May differ from sum of elements due to rounding.

TABLE 23

**REGIONAL ECONOMIC IMPACT: AVERAGE YEAR FOLLOWING AVERAGE 5-YEAR BASE CONDITION
COMPARED TO THE PREFERRED ALTERNATIVE AVERAGE YEAR CONDITION**

Region and Affected Sector	Employment (# of jobs)		Output (\$MM)		PoW Income (\$MM)	
	Direct	Total	Direct	Total	Direct	Total
Sacramento River						
Agric., Frst., Fish.	-10	-10	-0.4	-0.5	-0.2	-0.3
Mining	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0.0	-0.2	0.0	-0.1
Manufacturing	-10	-20	-1.6	-2.2	-0.6	-0.8
TCU	0	-10	-0.2	-0.9	-0.1	-0.5
Trade	-40	-70	-1.1	-2.1	-0.7	-1.3
FIRE	-10	-20	-0.8	-2.6	-0.5	-1.7
Services	-20	-60	-0.9	-2.8	-0.6	-1.7
Government	0	-10	-0.2	-0.7	-0.1	-0.3
Misc	0	0	0.0	0.0	0.0	0.0
TOTAL/1	-90	-190	-5.3	-12.0	-2.8	-6.6
San Joaquin River						
Agric., Frst., Fish.	0	-10	-0.2	-0.3	-0.1	-0.1
Mining	0	0	-0.1	-0.1	0.0	0.0
Construction	0	0	0.0	-0.1	0.0	-0.1
Manufacturing	-10	-10	-0.8	-1.1	-0.2	-0.3
TCU	0	-10	-0.3	-0.6	-0.2	-0.3
Trade	-10	-30	-0.4	-1.1	-0.2	-0.6
FIRE	-10	-20	-1.1	-2.1	-0.7	-1.3
Services	-30	-50	-1.2	-2.2	-0.7	-1.3
Government	0	0	-0.2	-0.3	-0.1	-0.1
Misc	0	0	0.0	0.0	0.0	0.0
TOTAL/1	-60	-120	-4.3	-7.9	-2.2	-4.2
Tulare Lake						
Agric., Frst., Fish.	0	0	0.0	0.0	0.0	0.0
Mining	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0.0	0.0	0.0	0.0
Manufacturing	-10	-10	-1.0	-1.3	-0.4	-1.3
TCU	0	0	0.0	-0.2	0.0	-0.2
Trade	-40	-50	-1.0	-1.4	-0.7	-1.4
FIRE	0	0	0.0	-0.4	0.0	-0.4
Services	0	-10	0.0	-0.6	0.0	-0.6
Government	0	0	0.0	-0.1	0.0	-0.1

Table 24

**REGIONAL ECONOMIC IMPACTS ON ALL SECTORS: AVERAGE YEAR FOLLOWING WET 5-YEAR
BASE CONDITION COMPARED TO THE PREFERRED ALTERNATIVE AVERAGE YEAR CONDITION**

Region Directly Impacted	Impacts on all Sectors					
	Employment (# of jobs)		Output (\$MM)		PoW Income (\$MM)	
	Direct	Total	Direct	Total	Direct	Total
Sacramento River						
Agriculture						
Reduced Output	0	-10	-0.4	-0.8	-0.2	-0.4
Reduced Net Income	30	50	1.0	2.6	0.5	1.4
Total Agriculture	20	40	0.6	1.8	0.4	1.0
M&I Water Costs	-60	-130	-3.9	-8.5	-2.0	-4.7
TOTAL 1/	-40	-90	-3.3	-6.7	-1.6	-3.6
San Joaquin River						
Agriculture						
Reduced Output	0	0	-0.2	-0.3	-0.1	-0.2
Reduced Net Income	100	170	3.7	8.1	2.1	4.5
Total Agriculture	90	160	3.6	7.8	2.0	4.4
M&I Water Costs	-80	-150	-5.0	-9.4	-2.6	-5.1
TOTAL 1/	20	10	-1.4	-1.6	-0.6	-0.7
Tulare Lake						
Agriculture						
Reduced Output	0	0	0.0	0.0	0.0	0.0
Reduced Net Income	-30	-40	-1.1	-2.1	-0.6	-1.1
Total Agriculture	-30	-40	-1.1	-2.1	-0.6	-1.1
M&I Water Costs	0	0	0.0	0.0	0.0	0.0
TOTAL 1/	-30	-40	-1.1	-2.1	-0.6	-1.1
Bay Area						
Agriculture						
Reduced Output	0	0	0.0	0.0	0.0	0.0
Reduced Net Income	0	0	-0.1	-0.2	0.0	-0.1
Total Agriculture	0	0	-0.1	-0.2	0.0	-0.1
M&I Water Costs	-60	-130	-4.4	-9.4	-2.4	-5.4
TOTAL 1/	-60	-130	-4.5	-9.6	-2.5	-5.5
California Total						
Agriculture						
Reduced Output	0	-10	-0.5	-1.1	-0.2	-0.6
Reduced Net Income	100	180	3.6	8.4	2.0	4.7
Total Agriculture	100	170	3.0	7.3	1.7	4.2
M&I Water Costs	-200	-410	-13.3	-27.4	-7.0	-15.1
TOTAL 1/	-100	-240	-10.3	-20.1	-5.3	-11.0

TABLE 25

**REGIONAL ECONOMIC IMPACT: AVERAGE YEAR FOLLOWING WET 5-YEAR BASE CONDITION
COMPARED TO THE PREFERRED ALTERNATIVE AVERAGE YEAR CONDITION**

Region and Affected Sector	Employment (# of jobs)		Output (\$MM)		PoW Income (\$MM)	
	Direct	Total	Direct	Total	Direct	Total
Sacramento River						
Agric., Frst., Fish.	0	-10	-0.2	-0.3	-0.1	-0.2
Mining	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0.0	-0.1	0.0	-0.1
Manufacturing	0	-10	-0.7	-0.9	-0.2	-0.3
TCU	0	0	-0.2	-0.6	-0.1	-0.3
Trade	0	-10	-0.2	-0.7	0.0	-0.3
FIRE	-10	-20	-0.8	-1.8	-0.5	-1.1
Services	-20	-40	-0.9	-1.9	-0.6	-1.1
Government	0	0	-0.2	-0.5	-0.1	-0.2
Misc	0	0	0.0	0.0	0.0	0.0
TOTAL/1	-40	-90	-3.3	-6.7	-1.6	-3.6
San Joaquin River						
Agric., Frst., Fish.	0	0	-0.1	-0.2	-0.1	-0.1
Mining	0	0	-0.1	-0.1	0.0	0.0
Construction	0	0	0.0	-0.1	0.0	0.0
Manufacturing	10	10	0.6	0.8	0.3	0.4
TCU	0	0	-0.3	-0.4	-0.2	-0.2
Trade	60	60	1.0	1.1	0.8	0.9
FIRE	-10	-10	-1.1	-1.2	-0.7	-0.8
Services	-30	-30	-1.2	-1.2	-0.7	-0.7
Government	0	0	-0.2	-0.2	-0.1	-0.1
Misc	0	0	0.0	0.0	0.0	0.0
TOTAL/1	20	10	-1.4	-1.6	-0.6	-0.7
Tulare Lake						
Agric., Frst., Fish.	0	0	0.0	0.0	0.0	0.0
Mining	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0.0	0.0	0.0	0.0
Manufacturing	0	-10	-0.5	-0.7	-0.2	-0.7
TCU	0	0	0.0	-0.1	0.0	-0.1
Trade	-20	-30	-0.5	-0.7	-0.4	-0.7
FIRE	0	0	0.0	-0.2	0.0	-0.2
Services	0	-10	0.0	-0.3	0.0	-0.3
Government	0	0	0.0	0.0	0.0	0.0
Misc	0	0	0.0	0.0	0.0	0.0
TOTAL/1	-30	-40	-1.1	-2.1	-0.6	-2.1
Bay Area						
Agric., Frst., Fish.	0	0	0.0	-0.1	0.0	0.0
Mining	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0.0	-0.1	0.0	-0.1
Manufacturing	-10	-10	-1.2	-1.9	-0.4	-0.7
TCU	0	-10	-0.3	-0.8	-0.2	-0.4
Trade	-20	-40	-0.8	-1.6	-0.5	-1.0
FIRE	-10	-10	-1.0	-2.2	-0.6	-1.5
Services	-20	-50	-1.1	-2.6	-0.7	-1.6
Government	0	0	-0.2	-0.3	-0.1	-0.1
Misc	0	0	0.0	0.0	0.0	0.0
TOTAL/1	-60	-130	-4.5	-9.6	-2.5	-5.5
California Total						

Agric., Frst., Fish.	-10	-10	-0.4	-0.7	-0.2	-0.3
Mining	0	0	-0.1	-0.1	0.0	0.0
Construction	0	0	0.0	-0.3	0.0	-0.2
Manufacturing	-10	-10	-1.7	-2.7	-0.5	-1.2
TCU	-10	-10	-0.8	-1.8	-0.4	-1.0
Trade	20	-20	-0.5	-1.9	-0.1	-1.2
FIRE	-20	-40	-2.9	-5.5	-1.8	-3.6
Services	-70	-130	-3.2	-5.9	-1.9	-3.8
Government	0	-10	-0.6	-1.0	-0.3	-0.5
Misc	0	0	-0.1	-0.1	-0.1	-0.1
TOTAL/1	-100	-250	-10.3	-20.1	-5.3	-12.0

Note:(1) May differ from sum of elements due to rounding.

TABLE 26

**REGIONAL ECONOMIC IMPACTS ON ALL SECTORS: AVERAGE YEAR FOLLOWING DRY 5-YEAR
BASE CONDITION COMPARED TO THE PREFERRED ALTERNATIVE AVERAGE YEAR CONDITION**

Region Directly Impacted	Impacts on all Sectors					
	Employment (# of jobs)		Output (\$MM)		PoW Income (\$MM)	
	Direct	Total	Direct	Total	Direct	Total
Sacramento River						
Agriculture						
Reduced Output	-700	-2240	-92.1	-194.5	-30.8	-86.9
Reduced Net Income	130	240	4.7	12.4	2.6	6.9
Total Agriculture	-570	-2000	-87.4	-182.1	-28.2	-80.0
M&I Water Costs	-60	-140	0.4	-0.9	-0.2	-0.5
TOTAL 1/	-630	-2140	-91.8	-191.6	-30.5	-85.2
San Joaquin River						
Agriculture						
Reduced Output	-10	-20	-0.7	-1.5	-0.3	-0.7
Reduced Net Income	-140	-240	-5.4	-11.7	-3.0	-6.5
Total Agriculture	-150	-270	-6.1	-13.2	-3.3	-7.3
M&I Water Costs	-80	-150	0.0	0.0	0.0	0.0
TOTAL 1/	-230	-420	-11.0	-22.7	-5.9	-12.4
Tulare Lake						
Agriculture						
Reduced Output	0	-10	-0.2	-0.5	-0.1	-0.2
Reduced Net Income	-100	-170	-3.6	-7.1	-1.9	-3.8
Total Agriculture	-100	-170	-3.8	-7.6	-2.0	-4.0
M&I Water Costs	0	0	0.0	0.0	0.0	0.0
TOTAL 1/	-100	-170	-4.4	-8.8	-2.3	-4.6
Bay Area						
Agriculture						
Reduced Output	0	0	0.0	0.0	0.0	0.0
Reduced Net Income	-10	-20	-0.6	-1.4	-0.3	-0.8
Total Agriculture	-10	-20	-0.6	-1.4	-0.3	-0.8
M&I Water Costs	-60	-130	-0.5	-1.1	-0.3	-0.6
TOTAL 1/	-70	-150	-5.0	-10.8	-2.8	-6.2
California Total						
Agriculture						
Reduced Output	-710	-2270	-93.0	-196.5	-31.2	-87.9
Reduced Net Income	-120	-190	-4.8	-7.8	-2.6	-4.1
Total Agriculture	-830	-2460	-97.8	-204.3	-33.8	-92.0
M&I Water Costs	-200	-420	-0.1	-1.9	-0.5	-1.1
TOTAL 1/	-1030	-2880	-112.2	-233.8	-41.4	-108.3

TABLE 27

**REGIONAL ECONOMIC IMPACT: AVERAGE YEAR FOLLOWING DRY 5-YEAR BASE CONDITION
COMPARED TO THE PREFERRED ALTERNATIVE AVERAGE YEAR CONDITION**

Region and Affected Sector	Employment (# of jobs)		Output (\$MM)		PoW Income (\$MM)	
	Direct	Total	Direct	Total	Direct	Total
Region and Affected Sector	Direct	Total	Direct	Total	Direct	Total
Sacramento River						
Agric., Frst., Fish.	-450	-630	-26.1	-33.0	-13.4	-16.6
Mining	0	0	0.0	-0.1	0.0	0.0
Construction	0	-30	0.0	-2.1	0.0	-1.2
Manufacturing	-230	-290	-64.9	-73.1	-16.9	-19.8
TCU	0	-120	-0.2	-16.8	-0.1	-7.5
Trade	90	-310	1.6	-13.8	1.2	-8.1
FIRE	-10	-200	-0.9	-22.7	-0.5	-14.6
Services	-20	-500	-1.0	-22.8	-0.6	-13.8
Government	0	-50	-0.2	-7.2	-0.1	-3.5
Misc	0	0	0.0	0.0	0.0	0.0
TOTAL/1	-630	-2130	-91.8	-191.6	-30.5	-85.2
San Joaquin River						
Agric., Frst., Fish.	-10	-20	-0.8	-1.2	-0.4	-0.5
Mining	0	0	-0.1	-0.1	0.0	0.0
Construction	0	0	0.0	-0.3	0.0	-0.1
Manufacturing	-30	-40	-3.8	-5.1	-1.4	-1.9
TCU	0	-10	-0.3	-1.2	-0.2	-0.6
Trade	-140	-210	-3.6	-5.8	-2.4	-3.7
FIRE	-10	-30	-1.1	-4.2	-0.7	-2.7
Services	-30	-100	-1.2	-4.3	-0.7	-2.6
Government	0	-10	-0.2	-0.5	-0.1	-0.2
Misc	0	0	0.0	0.0	0.0	0.0
TOTAL/1	-230	-420	-11.0	-22.7	-5.9	-12.4
Tulare Lake						
Agric., Frst., Fish.	0	-10	-0.3	-0.4	-0.1	-0.4
Mining	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0.0	-0.1	0.0	-0.1
Manufacturing	-20	-20	-2.1	-2.7	-0.7	-2.7
TCU	0	0	0.0	-0.4	0.0	-0.4
Trade	-80	-110	-2.1	-2.9	-1.5	-2.9
FIRE	0	-10	0.0	-0.9	0.0	-0.9
Services	0	-30	0.0	-1.2	0.0	-1.2
Government	0	0	0.0	-0.2	0.0	-0.2
Misc	0	0	0.0	0.0	0.0	0.0

[illegible]

SECTION 3
MUNICIPAL AND INDUSTRIAL WATER USE ECONOMICS

MUNICIPAL AND INDUSTRIAL ECONOMICS

The municipal and industrial economics analysis is based upon the Average-Average tiered pricing scenario. This analysis is based upon the impacts to CVP contractors. This is different than the municipal and industrial economic analysis that was included in the PEIS.

The PEIS municipal and industrial water cost analysis primarily evaluated the impacts on the need and cost to transfer water to non-CVP municipalities. Therefore, the analysis included water costs for many non-CVP water users. For example, the municipality in the San Joaquin River Basin was based upon the Cities of Stockton and Fresno water costs which are not based on CVP water, as described in the Municipal Water Costs Methodology and Modeling Technical Appendix to the PEIS.

The analysis included in the following table is based only on CVP contractors in order to define the cost of CVP water under the Tiered Water Pricing proposal.

TABLE 28

SUMMARY OF M&I ECONOMICS ANALYSIS FOR AVERAGE YEAR CONDITIONS FOR REGIONAL ECONOMICS

Result	Preferred Alternative Average	Change from the Preferred Alternative Average		
		Average-Average	Dry-Average	Wet-Average
Average Condition Supplies, 1,000 acre-feet (1)				
Sacramento Valley	929.0	0.0	0.0	0.0
Bay Area	1024.0	0.0	0.0	0.0
San Joaquin Valley	704.0	0.0	0.0	0.0
Central and South Coast	5921.0	0.0	0.0	0.0
Average Condition Economic Costs, Million \$ (2)				
Sacramento Valley	1.1	4.1	4.3	4.1
Bay Area	3.5	4.6	4.6	4.6
San Joaquin Valley	0.3	5.2	5.2	5.2
Central and South Coast	649.0	0.0	0.0	0.0
NOTES: Water transfers not considered as replacement supplies in this comparison. (1) After purchase or development of non-transfer replacement supplies to make supply equal demand. (2) Total costs include replacement supplies, restoration payments and metering. A negative cost means a net gain is estimated.				

APPENDIX D

LIST OF PREPARERS

APPENDIX D

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Dave Auslam, Socioeconomics
Principal Economist
CDM

Joel Elliston, Socioeconomics
CDM

Lee Frederiksen, Socioeconomics
CDM

Brian W. Hatoff, Cultural Resources
Senior Project Archaeologist
URS Greiner Woodward Clyde
RPA (Register of Professional Archaeologists)

Wayne S. Lifton, Fisheries Resources
Entrix, Inc.

Daniel Shoup, Cultural Resources
URS Greiner Woodward Clyde

Kent Smith, Vegetation and Wildlife Resources
H.T. Harvey and Associates

Andrew Gordes, Vegetation and Wildlife Resources
H.T. Harvey and Associates

Peter Standish-Lee, Water Resources
URS Greiner Woodward Clyde

Ken Swanson, Land Use Resources
Boyle Engineering, Inc.

Tom Taylor, Fisheries Resources
Entrix, Inc.

Paul Wisheropp, Water Resources
Entrix, Inc.

Wellington Yee, Project Scientist
URS Greiner Woodward Clyde